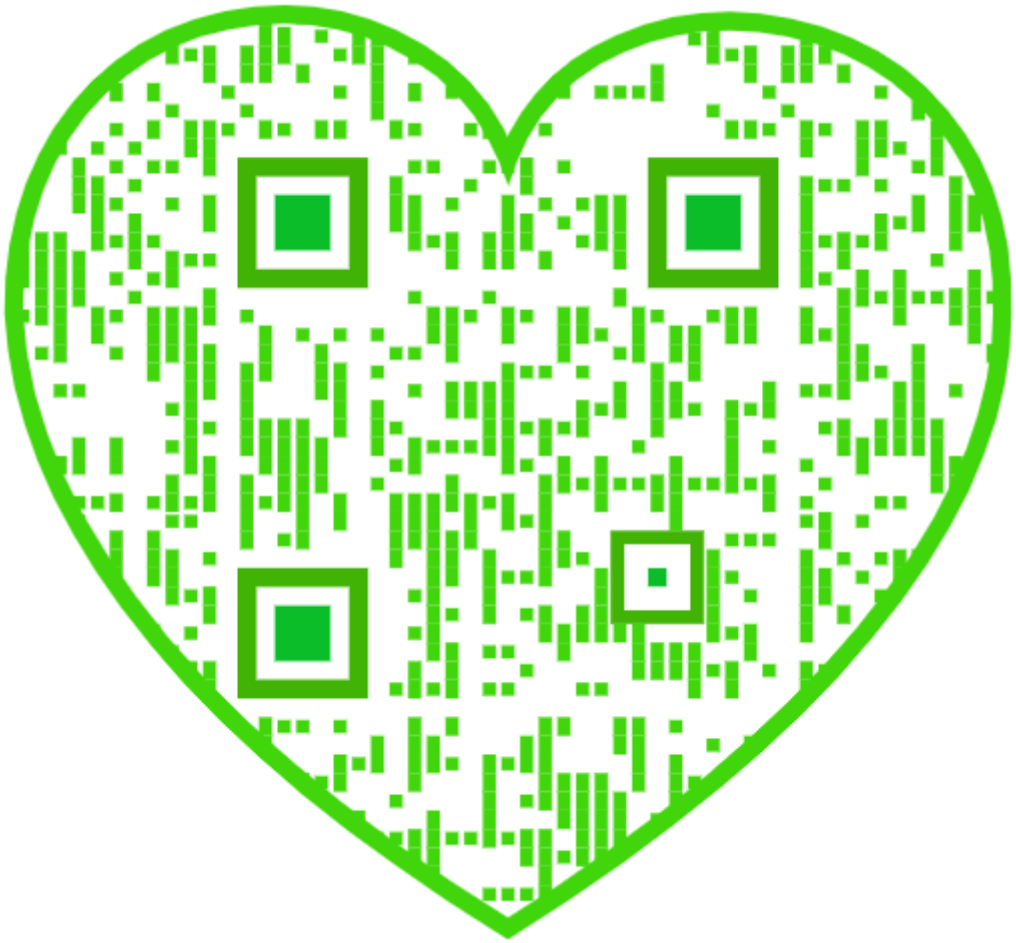
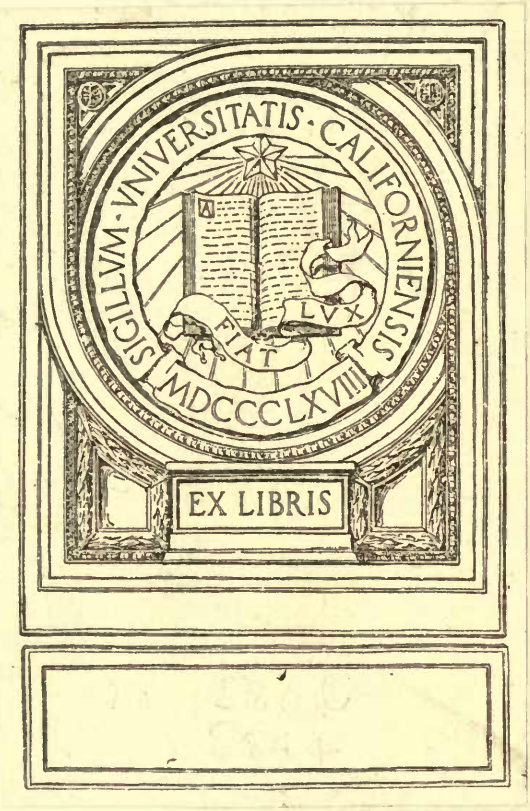
UC-NRLF
$C 3 351




SIGILLVM · VNIVERSITATIS · CALIFORNIENSIS
LVX
FIAT
MDCCCLXVIII
EX LIBRIS

LIBRARY
OF THE
UNIVERSITY
OF
CALIFORNIA.

John W. Stevens

LEATHER MANUFACTURE,

A Treatise

ON THE

PRACTICAL WORKINGS OF THE LEATHER MANUFACTURE

INCLUDING

OIL SHOE GRAIN, IMITATION GOAT AND CALF, BRIGHT OIL, ENGLISH AND AMERICAN BOOT GRAIN, HAND AND MACHINE SEWED WELT, GLOVE GRAIN, FLESH SPLITS, HARNESS LEATHER, THE SULPHIDE OF SODIUM PROCESS, OAK AND HEMLOCK BARK EXTRACTS. CONSTRUCTION OF TANNERIES,

---

TOGETHER WITH NUMEROUS VALUABLE RECIPES AND MISCELLANEOUS MATTER SPECIALLY ADAPTED TO THE LEATHER MANUFACTURE.

By JOHN W. STEVENS,

Author of "Mistakes of Tanners," Etc.

CONTAINING ILLUSTRATIONS OF MACHINERY AND MOST APPROVED APPLIANCES ADAPTED FOR THE CLASS OF WORK.

LONDON:
SAMPSON LOW, MARSTON, SEARLE & RIVINGTON,
Limited.
St. Dunstan's House,
FETTER LANE, FLEET STREET, E. C.
1891.
[*All rights reserved.*]

TS965
S7

Printed at Chicago, U. S. A.

45982

Dedication.

To My Grandson, John Warren Stevens.

I dedicate to you, this volume of a work now submitted to the tanning fraternity, with a diffidence and hesitation proportioned to the multiplicity of details and the practical workings connected with the Leather Manufacture.

Your grandfather, great-grandfather and uncles devoted a good portion of their lives to the now second largest manufacturing industry in this country. I trust that you, in your future walks, will not feel compelled to emulate the calling of your humble predecessors; but, in whatever position your inclinations lead, to give it your undivided attention, and fill the same with credit to yourself and honor to the name.

PREFACE.

The aim of the following hand-book is to present to the tanning fraternity, and to those who may hereafter engage in it, a full and complete sketch of the art of making several of the most popular and standard lines of fine shoe leather. It also contains a treatise on the sulphide of sodium process, oak and hemlock bark extracts, and the construction of tanneries.

The writer has refrained from following the usual custom of combining theory with practice, or in going into an extended treatise on the chemical properties of water employed in tanning, or the anatomy and chemical analysis of the hide structure. Science and chemistry are not to be ignored, however, by tanners endeavouring to produce good, serviceable leather at a lessened cost in the production. And, as they are now receiving more light through those channels than formerly, and also directly through practical chemistry, it would appear rather egotistical for "an old tanner" to treat of arts and sciences with which he is not practically familiar. Besides, it would tend to weary older tanners and abler students in technical literature.

The writer has, therefore, confined himself to the practical workings of leather manufacture, giving, in fact, his own personal experience in the making of several styles. It has been his special aim to use the plainest and simplest language, so that he who runs may read, and he who reads and follows the instructions given may profit thereby, whether he be an amateur or a professional tanner.

CONTENTS.

PAGE.

INTRODUCTION iii

CHAPTER I.

MANUFACTURE OF OIL SHOE GRAINS.

Class of Hides Most Desirable—Yield of Leather and Splits From Extreme Light Hides—Heavy Cows—Soaking and Liming—Dimensions of Tannery Pits 1

Uniform Weights of Hides Per Pack—Trimming the Hides—Glue Stock—Washing Hides in the Wheel—Water Supply—Splitting the Hides and Soaking in Cold Water 2

Tanner's Hide Trim 3

Fleshing the Hides—Removing the Nerves—Wash Wheel 4

Lime Reel—Liming 5

Reeling the Hides From One Pit to Another—Amount of Lime Required—Key to Pin the Hides Together—Float Attachment to First and Last Hide Going Into the Limes—Changing the Hides in the Limes Daily—High and Low Liming—Capacity of Lime Pits—Frequent Cleaning Out of the Lime Pits 6

Accumulation of Blood and Ammonia in the Limes—Slacking the Lime—"Dead and Live" Lime Pits—Openings in Top Center of Lime Pits For An Equal Distribution of the Liquor—Strengthening the Limes—Removing the Keys and Throwing the Hides Into a Hot Water Bath—Temperature of Bath—Unhairing—Removing the Lime and Epidermis—Washing in the Wheel 7

Bating—Condition of Hides and Water—Amount of Chicken Manure Used for One Hundred Hides—Difference in the Quality of Manures Used—Lime and Tannic Acid—The Bate Wheel—Temperature of the Bate—How to Test the Condition of Hides When Bated 8

"Bate Paicks"—To Prevent Putrefaction—Working out the Bate, or Fine Hairing—How Done—Condition of the Knife—Hot and Cold Limes—Bate Wheels 9

CHAPTER II.

COLORING OR SETTING THE GRAIN.

Coloring Wheels, Similar in Construction to the Bate Wheels—The England Wheel, how Made and Number of Revolutions—Density of Liquor in the First Stages 10

First Impressions—Time Necessary to Color the Pack—Suspending the Hides on Sticks—Dimensions of Sticks—Brass Screws for Connecting the Hides to Sticks—How Done 11

Arrangement of Pits—Daily Change of the Packs—Increasing the Strength of Liquors as Changes Occur 12

Over-feeding and Starving—"Black Rot"—Temperature of Liquors, and Density—Ripening Up Process—Gallic and Tannic Acid 13

The Long and Short Time Process—The Relief Corps—Time Required in Carrying the Hides through the Beam-house and Tannery—Spready Cows, Steers and Bulls 14

Hides Most Desirable—The Barb Wire Fence—The Change of Packs . . 15

Agitating the Liquors Frequently—Ample Space for the Hides to Feed—Taking out Packs for Sammieing—Steam Force Pump with Hose Attachment for Washing the Leather, Sticks and Pits—Running over the Liquors 16

Preparation of Bark and Amount Required—Bark Crushing Mill—Re-tanning the Splits 17
Grinding and Leaching the Bark—Bark Shaving Mill—The Bark Conveyer 18
Conveying the Bark from Mills to Leaches, and the Spent Bark to Boiler Room—The Press System of Leaching Bark—Pure Liquors and Moderate Heat Required—Comparisons Between a High and Low Temperature in Extracting the Tannic Acid from the Bark—Exhaust Steam Box—The Last Run on Old Leaches 19

CHAPTER III.

PREPARING FOR SKIVING.

Sammieing and Dampening the Leather—Trimming and Scarring Grain Imperfections—Oiling the Grain—Wheeling in Drum-Wheel—Skiving by Hand and Machine 20
Belt Knife Machine and Capacity of Same 21
Union Splitting Machine and Friction-Gear Attachment—Splitting the Leather 22
Shaving—Re-tanning in Drum-Wheel with Gambier and Sumac—The Amounts Required for a Given Number of Sides—Cost of Same—Scouring and Oiling 23
"Sammieing," or Hardening—Dampening—The Condition of the Leather for Stuffing—How to make a Suitable Test—Ripening the Leather for Stuffing 24
The Stuffing Wheel—When First Introduced—How Built and Diameter of Wheel 25
Amount and Nature of the Greases Used—Temperature of Grease and Wheel—Brown Grease, How Made—English Degras 27
Liquor Pumps—Adulteration in Oils 28
Stuffing by Wheel—Time Required—The Percentage of Greases Employed—Cooling Off the Leather—Setting—Giving Character to the Sides . 29

CHAPTER IV.

SLICKING OFF AND BUFFING.

Buffing Off the Grain—Object and Advantages Derived—Plain Square Liquor Pipes 30
The Origin of Oil Shoe Grain and Its Great Popularity—Barb Wire Scratches—Buffing or Snuffing—Unsight and Unseen 31
Tanners should Demand Redress for the Damage by Barb Wire Fences—Blacking and Finishing—Preparing the Logwood—Amount of Logwood and Sal-soda 32
Blacking the Leather and Preparing it for Pebbling—The Pebbling Jack. 33
Pebbling—The Figure of Roller and Uniformity Required—The Staking and Perching Machine 34
Graining with Cork-Board—Number of Angles on Grain and Flesh Sides—Soft Boarding. 35
Dressing with Blacking and Beef Blood—Recipe for Making the Dressing—How Put On—Cleanliness—Drying and Oiling Off 36
Nature of Oils Used in the Final Finish—Brown Grease vs. Tallow—The Proportions of Oil and Grease—Temperature of the Room and Oil . . 37
Assorting and the Several Classifications—Measuring the Leather—How Put Up—The Ripening Process—"Levant" a Substitute for Beef Blood 38
Recipe for Making Grain Blacking, and Cost per Gallon 39

CHAPTER V.

FLESH SPLIT FINISHING.

Assorting and Trimming—The Percentage Obtained Suitable for Flesh Finish—Grain Splits Re-tanned and Sold in the Rough—The Several Classifications and Weights Most Desirable—Shaving and Leveling by Machine 40

Re-tanning in Drum Wheel with Gambier—Amount Used per Wheel—Finishing Out the Tanning in Pits, with Bark Liquor Scouring and Drying—Dampening 41
Stuffing—Weight of Each Batch of Dry or Dampened Splits—Nature of Greases Used, and Quantity of Same—Temperature of Grease and Wheel—Time Required in the Wheel 42
Setting and Drying—Whitening—Blood Veins—Trimming—Soft-Boarding on the Grain Side—Finishing 43
Glassing on Grain Side by Jack-Machine—Recipes for Making Blacking and Paste 44
Recipe for Preparing the Gum—Blacking and Glassing 45
Pasting and Glassing—Oiling, Glassing and Gumming—Proportionate Parts of Gum and Paste, also Oils 46

Rain or Condensed Steam Water for Pastes and Dressings—Style of Sponges Used—A Lusterless or Bright Finish—Putting up the Splits in the Several Classifications. 47

CHAPTER VI.

Construction of Tanneries.

Ground Plan of Tannery 48
An Imaginary Tannery—City and Country—Water Supply—Precaution Against Freshets and Inundations—Preparing for the Foundation—Pits and Junk, how Built 49
Mixing of Clay and Precautions Taken in Applying—Liquor Log Conveyers, how Set—Kind of Timber Used for the Foundations 50
The Safest and Most Economical Style of Pits—The "Box" and the "Buffalo" Pit—How Built and Connected with the Liquor Log Conveyers 51
Claying on the Outside of Pits—When in Position Fill with Water—The Tanner who Built on too Economic Principles—"Saving at the Spig and Opening Wide the Bung-hole" 52
Finishing Shops Connected with the Tannery not Advisable—When Separate the Tannery may be Built at Comparatively Small Expense—Single Story and of Piles Set in the Ground—The Roof Supported by Trestle Work—Constructed of Stone and Brick—Protection from Cold—Skylights 53
Interior Arrangements—The Beam-house and Tannery Under the Same Roof—Soaks and Limes—The Several Styles of Machines and How Placed—No Retrograde Movements—Adoption of System—Leach House 54
The Leaches to Be of Easy Access to the Tannery, But Separate from It—How Built—Round or Square Box-Leaches—Foundation 55
The Material Used in the Construction of the Round Leach—Capacity—Bearing—Average Service of the Round Leach—Dry Rot—Loss of Liquors—How Remedied 56
Mixture of Porgee Fish Oil, Tar and Red-Ochre for Preserving the Wood Work—Painting Tannery Buildings and Tools 57
False Bottoms of Leaches for Preventing the Fine Dust from Entering the Pits—Connecting the Leaches with Log Conveyers to the Pits and Liquor Pumps—Density of Liquors Produced for Sole Leather Tanning. 58
Pumping Capacity—Bark Mills, where Located—The Conveyer System, how Arranged—Engine and Boiler-house, where Located 59
Brick or Stone Building for Engine and Boiler-house—Kind of Boilers—Smoke-stack—Wet Tan Ovens—Capacity of Boilers and Engines, and Errors Made When Building and Setting Up Machinery—Light, Sunshine and good Ventilation Indespensable in Tannery and Finishing Shops—Splitting and Finishing Departments—Fire-risks—Miniature Railway from Tannery to the Shops—Origin of Fires—How Protected. 60

Fire-Proof Rooms — Pumps and Hose Ready for Action — Finishing Shops, How Built—Foundation for Machinery—Dimensions of the Building—The Several Departments 61
Stuffing Wheels, Steam Jacket Kettles, Oil and Grease, Where Located—Steam Elevators—Sole Leather Tanneries—Scrubber and Rolling Machines, Where Located—Air-Tight Compartments for Ripening the Leather—Uniform Temperature for Dry Finished Leather—Offices—Heating and Drying—Olden-time Methods of Drying—Frozen and Thawed—One Good Freezing Considered Equal to a Layer of Bark—Loss in Weight by Freezing 62
Freezing Beneficial to Some Kinds of Leather—Artificial Heat, Light and Air—Arrangement of Steam Pipes—Ventilators, how Made and where Located—Temperature of the Lofts—True Principle of Ventilating . . 63
Uniform Circulation of Damp Air—Objections to Placing Steam Pipes on the Floor and under the Wet Leather—Hide House, how Built—Ample Space for Assorting, Trimming and Re-salting—Fire-proof—Rates of Insurance—Radical Changes from Old-time Methods—Concentration of Capital—"Not too Many Eggs in One Basket." 64
Precautions Against Fire—Hide Values—Approximate Value of Hides and Leather in Pits—Bark Sheds, how Built—Depreciation of Bark where Exposed to Rain and Sunshine—Corrugated Iron Sheds—Facilities for Receiving Bark 65

CHAPTER VII.

Imitation Goat and Boot Grain.

Imitation Goat, as made from Cow Hides—When First Introduced to the Trade—Experiments Made—Substances—Bright and Dull Finish . . . 66
Short Life Predicted—Comparative Cost with Goatskins—New Standard Lines—Class of Hides Best Suited—Preparing the Hides—Rough Leather Tannage—Liming and Bating—Coloring and Suspending on Sticks—Time Required in Tanning 67
Skiving and Snuffing Off Imperfections on Grain—Selections Made For the Several Grades—Marking the Sides For Future Reference—Splitting by Belt Knife or Union Machine—Stoning Out the Coarse Portions 68
Shaving—Re-tanning in Sumac—Uniform Color—Drum Wheels for Re-tanning—Amount of Sumac and Water Used Per Wheel 69
Time Required in the Wheel—Scouring and Oiling On Grain and Flesh—Grain Cracking—Sammieing 70
Light and Air—Drying and Dampening—Setting on Grain—Oiling and Drying 71
Blacking—Recipe for Making the Blacking—Drip Water or Condensed Steam—Logwood Mordant and Sal-Soda—Clean Black—Cleanliness of Employes—Advantages Derived by the Use of Sumac in Re-tanning . 72
Wearing Quality in Comparison to the Real Goatskin—Blacking—Trimming and Applying the Scar Paste to Grain Imperfections—Recipe for Making Scar Paste—Imitation Goat Dressing—Recipe for Making It . 73
Pebbling—The Character of the Print—Wet Boarding on the Grain With Cork Board—Second Dressing of Blood and Blacking—Drying 74
French and American Tanners—Cleanliness and Artistic Manner in Putting up Stock—The Coming World's Fair—Fact and Fancy—The Continued Boarding on Grain and Flesh—Polishing by Machine—Restoring the Print by Cork Boarding. 75
An Average Day's Work of Hand Boarding—Oiling Off—Nature of Oils and Proportionate Parts—Bright Oil or Half Bright Imitation Goat, how Made—Oiling Off and Nature of Oils—Straight Grain, how Made . . . 76
Boot Grain—American and English Styles—How Tanned and Finished—Bright and Dull Finish—Buffing off the Grain—Sides and Crops—Service and Comfort 77

CHAPTER VIII.

Welt Leather.

Style of Leather Required—Oak and Hemlock—Free from Imperfections on Grain and Flesh—Taking Off the Heads and Skirtings—Backs—Preparing for Skiving—Hand-sewed and Machine-sewed Welts—Substance of Each—Skiving and Splitting—Shaving and Re-tanning in Gambier 78
Scouring, Oiling and Sammieing—Dampening and Setting—Hand Stuffing—Nature and Proportions of Grease Used—Drying—Slicking on the Flesh—Buffing off the Grain for Machine-sewed—Assorting and Putting up for Shipping 79–80

CHAPTER IX.

Manufacture of Glove Grain or Imitation Calf.

When First Introduced—More Recent Improvements Made in the Tannage and Finish—The Advantages Over Waxed Calfskins—Class of Hides Required—Buffing Off the Grain 81
Medium Weight Veal Kips are Employed for this Work—How to Produce the Required Full and Plump Flanks 82
Hide Trim—Glue Stock—The Close Trim Adopted by Calfskin Tanners. 83
Cut of Hide 84
As Nature Formed Them—Preparing the Hides—Basis for a Pack—Washing in the Wheel—Splitting and Soaking—Time Required in Soaking . 85
Wash Wheel—Fleshing 86
Dry Flint Hides—How Treated—Fleshing and Green-shaving Before and After Liming—White Spots on Leather, the Cause—The Evil Results of Green-shaving 87
The Net Work of Nerves, and how Removed—Quality Rather than Quantity of the Work Performed by the Beam Hands 88
Cut of Key for Pinning the Hides Together—Loss of Gelatine—Washing and Preparing the Hides for the liming 89
Hide Reel, how Operated. 90
Lime Required for a Pack of Hides—Cleaning Out and Making New Limes—Changing Over the Packs and Time Required in the Process—Soles and Upper Leather Liming 91
Hot Water Bath, Temperature of Same—Unhairing and Washing in the Wheel—Leveling the Pates 92
Pate Splitting Machine—Friction Gear for Union Machine—Bating . . . 93
Loathsome Neutralizing Agent—Amount of Chicken Manure required for the Pack—Temperature of Bate and Time required for Neutralizing the Lime 94
Fermenting the Manure before Using—How Prepared—Cleanliness . . . 95
Daily Routine of the Beam-house work—Working Out the Bate—Washing in Cold Water 96

CHAPTER X.

Coloring, or Setting the Grain.

The English Handling Wheel, how Constructed—Is one of the best Labor-Saving Appliances in the Tannery, when Judiciously Used 97
Whipping Out the Nap—Clean Wheel and Pure Liquors—The Diamond Figure on Grain—Fact and Fancy 98
Suspending in the Pits—The Difference Between Buff Leather and Imitation Calf—"Glace Calf," "Satinoil," "Satin Calf," etc.—Soda Ash and Sulphur in Connection with Lime for Depilating—Thick Grain—Time required in the Tanning Process 99
Tannery and Pit Capacity—"Buffalo" Pits—Dimensions of Sticks for Hanging—Brass Screws—Method for Connecting the Hides to Sticks . 10

Saving of Time and Labor by Suspending—Changing the Packs—Density of the Liquors—"Onward and Upward" the Tanner's Motto 101
Overfeeding and Starving—Classifications—Steer, Cow and Bull Hides—Age, Size, Weight and Composition of Hides—Cleanliness—Use of Steam Pump and Hose—Water Supply 102
Time Required in the Tanning Process—The Bark Crusher—Relief Corps—Density of Liquors in the Later Stages 180

CHAPTER XI.

Amount of Bark Required.

Bark Mills—Re-tanning of Sides and Splits 104
Grinding and Leaching—The Press System—Pure Liquors 105
Preparing for Skiving—Wheeling—Giving the Sides Their Natural Contour 106
Skiving by Hand or Belt-knife Machine—Barb-wire Imperfections and Horn Marks—The Treacherous Barb 107
The Revolving Spur as a Substitute—Tanners Should Take a Decided Stand 108
Seventy-five Per Cent of the Hides Are Disfigured by Coming in Contact with the Treacherous Barb-wire—"Unsight and Unseen"—Present and Prospective Supply of Hides—Classifications 109
Leveling and Shaving 110
Re-tanning the Splits—Gambier and Other Tanning Agents 111
Splitting—The Belt-knife Machine a Favorite with Tanners Making Light Grain Leathers 112
Shaving—Private Marks 113
Re-tanning the Sides—Gambier and Sumac—Amounts Used 114
Cost of Re-tanning—Oak Extract—Scouring and Sammieing 115
Dampening and Preparing for Stuffing 116
Stuffing Wheel and Greases Used—Capacity of Wheel 117
Jacket Steam Kettles—Direct Steam—Ventilator—Nature of Greases and Temperature of Wheel and Grease. 118
"Practice Makes Perfect" Stuffing 119
Setting and Drying 120
Slicking and Buffing 121
Roughing Off and Snuffing the Grain—Recipe for Grain Blacking—To Prevent Piping of the Grain 122
Preparing the Mordant—Sal Soda and Logwood 123
Glassing and Oiling—Recipe for Making Paste—Pasting and Soft Boarding—Grain Dressing. 124
Soft Boarding—Glassing out of Paste 125
Gumming—How the Gum is Prepared and Its Consistency 126
Drying and Matching the Sides—Measuring and Classifying—Putting up for shipment. 127

CHAPTER XII.

Sulphide of Sodium Process.

A Comparatively new Agent in this Country for Depilating and Depleting the Hides 128
Its Action on Hides and Skins—How Applied 129
Experiments Made by the Quick Time Process—No Bating Required . . 130
The Lime Used in Connection Robbed of Its Caustic Properties—Exhausting the Tannic Acid more Rapidly—Liming and Bating Abolished—Sole and Upper Leather—The Tannery a Sweet Smelling Institution. 131
Destruction of the Hair, but a much Greater Gain in Weight of Leather—The Hot Bath—Amouut of Sodium per Hide—Acid and Non-acid Sole Leather 132
Result of First Experiments for Rough Leather—Plumper Flanks and Shoulders and a Thicker Grain—Color 133

The Superior Quality and Thickness of the Grain Produced by the Use of Sulphide of Sodium Makes It Especially Adapted for Sole and Upper Leather, where the Grain is Buffed Off in Finishing. 134
It is a Softening and Preserving Agent and of Value when Working Dry Flint Hides—Amount Used per Hide in the Soaks 135
Shy of Adopting New Methods—Imaginary Results—Opposition from the Beam Hands 136
Sulphide of Sodium made from Tank Waste, is in Small Crystals—Experiments as Made in 1873, and the Results 137
Correspondence with Tanners—Used with Lime or Pipe Clay in the Form of Paste—The Liquid Form More Practical 138
Acid in Connection for Sole Leather Tannage—Experiments Made at a Milwaukee Tannery by the "Lightning Process" 139
Tanners Skeptical on Accouut of the Color of the Grain when Going into the Liquors—No Fear of Injuring the Hides by Its Use. 140

CHAPTER XIII.

Harness Leather.

Class of Hides—Trimming—Horn Marks and Imperfections On Grain and Flesh—Preparing in the Beam House—Sulphide of Sodium in Place of Lime and Chicken Manure 141
Suggestions in Relation to Buffing Off the Grain—Imperfections Removed by Buffing 142
When Fairly Tanned by Suspension Put Them in the "Lay-Aways"—Sammieing, Skiving and Re-Tanning 143
Scouring and Sammieing—Dampening and Ripening 144
Stuffing by Wheel—Temperature of Grease and Wheel—Nature of Greases Used 145
Advantages in Wheel Stuffing Over Hand Stuffing—Practically Waterproof 146
Setting and Drying—Blacking—Finishing 147
Tallow Dressing—Trimming—Harness Mordants 148
Recipe For Harness Black 149

CHAPTER XIV.

Oak and Hemlock Bark Extracts.

Bark Supply—Increasing Demand For Extracts For Export—Advantages Derived by their Use 150
Chemical Analysis of the So-called Spent Bark—Upper and Sole Leather Tanneries—Concentration of the Liquors in Vacuum Pans—Retrospective View 151
Opposition to Changes from Old-time Methods 152
The Future of the Leather Manufacture—Old Fogies—Science and Chemistry—Decided Improvement in the Quality of Extracts during the past Ten Years—Enterprising Tanners 153
Increased Cost of Gambier since the Dongola Tannages came into Existence—Storage Capacity—No Fermentation or Decay—Handy to Have in the Tannery 154
Standard Extracts—Sulphuric and Gallic Acids—Barkometer Tests—Experiments Made by Prominent Extract Manufacturers—Examples—Twaddles' Hydrometer 155
Successful Sole Leather Tanners—Sole and Upper Leather Liquors—Percentage of Tannic Acid in Bark—Illustration 156
The Medium Tannages—Acid Sole Leather—Waste of Bark—Extracts Used too Strong in the First Stages 157
The Advantages Derived through the Use of Extracts—Storing—Tanks and Steam Pipes for Mixing—Temperature of Liquors—First Impressions 158

Harness and Upper, Union Tanned —"Reds," or Anhydrides, when Soluble—Results of General Introduction of Bark Extracts and Abolishing the Bate Nuisance 159

CHAPTER XV.

Abreast with the Times.

A Noteworthy Fact—Leather Manufacture in Chicago and Milwaukee—Capital Employed and Annual Products—Cords of Bark Used—Eastern and Western Tanners 160
Dry Flint and Green Cured Hides—Western Calf, Kip and Grain Leather—Change in Styles—The Tendency of Consumers of Footwear—Ever Watchful in Catering to the Wants of Fickle Humanity—Dongola Kid. 161
The Introduction of New Styles—To Witness More Radical Changes—Waxed Calf and Kip Output in Chicago—Compared with French Skins—Reducing the Importation of French Skins—Credit to the Western Tanners—Eastern Tanners on the Anxious Seat 162

VALUABLE INFORMATION.

Something About Warbles—320,000 Species of Insects in the World—The Stupidest is the Female Ox Bot—In Britain a "Warble," in America a "Grub"—Depositing the Eggs—Eating Their Way Out 163
Description and Cuts of Warbles 164

Imitation of Kangaroo.

Class of Hides and Skins Used—Qualities and Cost of Kangaroo 165
Calfskins and Horsehides Make Very Desirable Imitations at Comparatively Small Cost—The Tannage and Finish—Sulphide of Sodium for Depilating the Skins 166
Suspending the Skins—Change of Liquors—Shaving, Retanning and Scouring—Stuffing—How Prepared—Bright, Half Bright and Lusterless Finish. 167
Batches and Number of Pounds per Wheel—Nature of Greases Used—Temperature and Time Required—Nature of Tannage—Setting and Drying—Finishing 168

Skinning and Curing Veal Skins.

By Carroll S. Page, Hyde Park, Vt.—A Talk with Butchers 169
Sticking the Calf and Bleeding—How Done 170
Ripping—Skinning the Legs—The Correct Way of Taking Off the Skin . 171
The Proper Pattern—Right and Wrong Way 172
Skinning the Head and Body—Prize of $50 for the Best Methods . . . 173
Drawn Skins—Wooden Implements Used—First Method 174
Second Method 175
Curing—Never put a Skin in Pickle—To be Kept Free from Blood . . . 176
Directions for Handling Skins when Taken Off, and Manner of Shipments. 177

Codfish and Tanners' Oils.

The Several Species of Fish Oils—How Expressed From the Livers—Second and Third Runs 178
Pure Cod, Thick Oil and Blubber—Chemical Composition of Cod Liver Oil—Porgee Fish Oil—How Made—Its Good Qualities for Painting, but Objectionable for Leather Purposes—It Has Given Considerable Trouble to Tanners—Mixing with Paraffine Oil—Proportions 179
How to Test Fish Oils—Oftentimes Oil Dealers Are Blamed Without Cause 180

Raise The Standard.

Competitions and Close Margins 180
Ambition to Excel in the Output, with Less Attention to Style and Quality—Theories Will Not Bridge Over the Chasm—With a Life Experience There is Always Something to Learn 181

How Raise the Standard when Margins are so Close—Employers Look More to Salary than Brains in the Management—A Figure Head—"Punch and Judy"—Eternal Vigilance 182
Strict Economy—System and Method—Have a Place for Everything—Make the Tannery and Workshops Attractive and Clean—Invent Something—Treatment of Workmen—Essential Qualifications 183
Harmony and Concert of Action Necessary—The Time Never More Auspicious to Take the Initiative 184

PAST, PRESENT AND FUTURE IN THE LEATHER MANUFACTURE.

Has Been a Slow-going Process—Improvements Made the Past Twenty-five Years—Sole and Wax Upper Leather Tanning—Unbelievers . . . 184
The Ice Has Been Broken—A Revolution in the Art of Making Leather Predicted—Tanning by Electricity—How Done—Its Advantages Over the Old Methods—Use of Extracts—Continuous Agitation of the Fibers of the Hide and Results 185
At the Opening of the Twentieth Century—Prospective Process of Tanning Hides and Advantages Derived—No Shoddy 186

KANGAROO.

Kangaroo Skins from Australia Tanned in America—When the Skins Were First Introduced in this Country—Very Tenacious and of Thick Grain—Impervious to Water—What Constitutes "a Set," for Hunting the Kangaroo—Tactics of the Animal 187
Hunter's Protection—Agility of the Kangaroo—Different Sorts—Hunters Realize Several Thousand Dollars Each, Free of Living Expenses—Where the Skins are Tanned and Sold 188

ORIENTAL TANNERS.

The Egyptian Curriers—Their Products—Beautifully Embossed Leather Found Fastened Round the Mummies—Leather Considered Unclean by the Hindoos, and Those Who Work in It Are Defiled—Shoemakers are of the Very Lowest Caste of India—The Chinese Process of Tanning—Jewish Sacrifices Afforded the Skin Market a Copious Supply—Leathern Bottles and Drinking Vessels—Only One Tanner Mentioned in the Bible, Simon—Relics of Leather from the Egyptian Tombs in a State of Perfect Preservation, which Passed through the Hands of the Tanner More than Thirty Centuries ago 189

HEALTHY HIDES.

Communicating Disease an Impossibility, after Going Through the Different Processes 190

CHINESE HIDES.

The Hide Trade in China—Exports to England and America—The First Shipment—Hides are Strong, Sun-dried and Short-haired—Not a Great Hide Producing Country—Those Cut or Otherwise Injured are Tanned at Home—Heads and Shanks Cut Off—Are Treated with a Worm or Insect Powder—The Chinese Tricky in Regard to Weights 191

VACUUM TANNING.

Has Long Engaged the Attention of Tanners—Nature Abhors a Vacuum—Difference between Theory and Practice—Machinery Employed—Reservoir and Rocker Motion—The Air is Exhaustively Pumped Out—Claims of an Inventor 192

ANALYSIS OF TANNIC ACID.

The Value of Science in the Development of Industry—That of Tanning has been Neglected 192

Good Chemists and Good Mechanics—The Discovery of Bark as a Tanning Agent an Accident—Combination of Tannic Acid—Analysis of Barks 193
Importance of a True Knowledge of Chemistry—Visits to Oak Hemlock Tanneries 194

TANNING EXTRACTS AND MATERIALS.

Abstract of a Lecture before the German Tanners' Association, by H. W. Eitner, of Vienna Experimental Station—The Subject an Important one in Modern Tanning—The Application of Tanning Extracts 194
The time when Tanners Sneered at Extracts—Able to Compete in the World's Markets—English and American Extract Tanning—Opinions Begin to Differ—Gaining New Advocates at every Step—In England all Upper and Lighter Skins are Tanned with Extracts 195
A Grading of the Baths—Time the Skins Are Immersed—Hydrometer Tests Not Reliable—Oak and Valonia Extracts 196

A STUFFED HUMAN SKIN.

Pranzeni, the Paris Murderer's Skin, Made Into Card Cases—Romantic History of a Man Who Figured in Austrian Emperor's Private Museum and Whose Skin Was Stuffed—The History of Angelo Soliman.. 197
Offspring of a Native King—Kidnapped—Sold as a Slave—Future History 198

TANNIN FROM CANAIGRE.

A New Candidate For Tanners' Favor—The Roots Four to Six Inches Long and Resemble Potatoes—Results of Chemical Analysis—Known as Rheotannic Acid 199
Percentages Extracted by Solvents From the Air-Dried Root 200
Analysis of Canaigre Root by Prof. Elsom—Tannic Acid 201

SPONTANEOUS COMBUSTION OF LAMPBLACK.

Fires Occurring From Spontaneous Ignition of Vegetable Black Are Very Common—Time Required—Caused by Absorption of Oil—Factories Burned—The Cause Traced 202

TANNING BY ELECTRICITY.

Making Leather is Now Essentially the Same in Principle as it Was in the Days of Pharaoh—Some Improvements in Preparing the Hides—An English Patent Proposes to Pass a Current of Electricity Through the Pits Containing the Tannin 203

CUTCH AND WATTLE BARKS.

The Acacia Family of Plants an Important One in Many Parts of the World—Acacia Catechu, the Extract of Which Produces Cutch or Terra Japonica, a Product of India and Africa—Acacia Decurrens or Black Wattle—Rich in Tannin—Price in Melbourne and England . . 204
Experiments Made by Von Mueller, of Melbourne—One Ton ot Bark Yielded Four Cwt. of Extract of Tar Consistence, and Sold in London in 1853 at $250 per Ton—Numerous Methods of Extracting 205

A TALLOW TREE.

A Remarkable Tree, Native of China—Quantities of Oil and Tallow are Extracted from Its Fruit—The Seed—Method of Separating the Products 206

LEATHER BELTING.

A Large Industry—Complaints of Belts Doing Poor Service—The Principal Difficulty—Power Transmission under the Direction of a Competent Engineer 206

Maximum Capacity and Minimum Motion; Terms Reversed—Mr. Arnold in His "Mechanical Principa" Gives some Valuable Data on the Velocity and Driving Power of Belts—Reproduced—How to Regulate Speed of Shaft 207

CHAPTER XVI.

Simple Interest Rules.

Methods of Computing Interest on any Given Sum from Four to Twelve Per Cent—Facts Worth Knowing 208

Tanning Mixture for Glove Leather, Etc.

The Several Ingredients Used 209
How Prepared—Sumac, Oak Bark and Nutgalls—Temperature of Mixture—How Applied—Quick Tanning—Will Take any Color and not Fade 210

Carbolic and Sulphuric Acids.

Carbolic Acid as a Disinfectant and Preservative for Hides—Also as a Bate for Neutralizing the Lime in Connection with Muriate of Ammonia and Alum—Invention of one Perkins—Recipe for Making . . . 210
What is Claimed for It as a Bate—The Process Simple and Feasible—Objectionable Relics—Sulphuric and Acetic Acids for Plumping Sole Leather Hides 211

Raw Hide Belting.

Process of Preparing the Hides—"Indian Processs" in Five Acts 211
Composition of Oil and Tallow to Render it Soft and Pliable—Cut into Strips—Retains all of its Gelatinous Substance and Fiber Tissues Unimpaired—Claims made for It 212

A Tanning Process for Use on a Farm.

Soaking and Fleshing—With the Hair On—Ingredients Used for Tanning—To Tan with the Hair Off—Ingredients Used and How Applied . 212

Quick Method of Tanning.

Combination Process for Hardening and Preserving the Leather—Of what the Invention Consists—The Process for Tanning Fifty Skins 213

Removing Acids from Leather.

Invention for Neutralizing the Acids which Remain in the Hides after being Tanned—Ingredients and How Applied 214

Artificial Leather.

Process by which Artificial Leather is being Made in Germany—How Scraps of Leather and Sinews are Treated in Hydrochloric Acid—Mixed and Pressed into Sheets, giving to the upper Surface a thin coat of Caoutchouc in Solution with Carbon Bi-sulphide, in Imitation of the real Cuticle of a Skin 214

Extract Tanning.

To Produce Good Leather at Low Cost an Important Question—Tests Made by a Tanner and Advantages Derived—No Waste or Evaporation—The Barkometer is Useless to Test the Relative Values of Extracts—The Proper Way 214

Hides of Farm Slaughtered Animals.

Careless Manner in which They are Taken Off—Calf and Sheep Pelts Ruined—How to Make Them Valuable and Attractive—Hints in Regard to Taking Off a Hide—Salting—Staking Out 215

THE WEIGHTING OF LEATHER.

Taking Advantage of the Consumer—Experiments Made by M. Eitner, the Well-known Chemist at Vienna—The Sulphate of Baryta is a Product from Chloride of Barium and Sulphuric Acid; is a Delusion and a Fraud—Blood Poisoning 216

ART IN OILING SHOES.

The One-Armed Bootblack's Contract—When He Began Business He Made the Mistake by Applying the Oil Without Dampening the Leather—The Socks of His Customers were Soiled—The Leather Remained Hard—The Lost Customers—What an Old Shoemaker Told Him—The Result 217

SHAGRIN LEATHER.

Celebrated for Its Hardness and Strength—Peculiarity of Its Grain—Globular Granules—Is of Eastern Origin—Its Production for a Long Time Kept a Secret 217

TANNING HIDES AND SKINS WITH HAIR ON.

Convenient Method for Farmers or Others to Tan Hides and Dress Furs—Recipe 218

ABOUT SUMAC.

Luxuriant Growth in Kentucky and Virginia—Richer in Tannin than the Best Sicily—A Bleaching Agent 218

COLORING FURS.

Process for Coloring Furs after Being Tanned 219

A "FORGOTTEN" COLOR FOR GLAZED LEATHER.

A decoction of Onion Peel Communicates to Glazed Leather a very beautiful Orange Yellow—As a Mixing Color 219

CONSTITUENTS OF HIDES.

Wherein Text Books have Failed—A Healthy Skin is Soft, Flexible and Porous. 219

Hides from Healthy, Well-fed Beasts Make the Best of Leather—Life and Death—Cool Sweating—Ammonia and Fatty Matter—Cause of the Superior Weight of Sweated Leather—Tannin, Fiber and Gelatine . . . 220

TRANSPARENT LEATHER.

Patent Process—Ingredients employed and Methods for Introducing . . 221

LIGHT GREY COLOR FOR DYEING KID.

One of the Most Difficult Tasks—Preparation by a Well-known Chemist, and Highly Recommended—Recipe and Number of Coats Required . 221

NEW SUBSTITUTE FOR LEATHER.

Process for Making Artificial Leather from Red Beechwood—From Fifty to Sixty-year-old Trees—How Treated—Claimed to be Superior to Animal Leather 221

GLUCOSE IN LEATHER.

The Falsification of Weight of Leather by Adding Glucose or Grape Sugar—A Simple Test is Recommended—Samples of Sole Leather said to Contain from Thirty to Forty Per Cent of Extra Weight 222

SOFTENING LEATHER.

Castor and Neatsfoot Oil—Moisture—Leather First Prepared by a Thorough Wetting—Much Less Oil Required—Water as a Repellant . . . 223

UNPREPARED INDIAN HIDES.

AmericanTanners Use Large Numbers of Indian Hides—Average Weight—Artificially Increasing the Weight by Smearing Them With Several Coats of "Chenam"—Is Universal in India—Increases the Price Some Forty Per Cent 223

ANOTHER METHOD OF TANNING.

A Process of Tanning With Soap and Carbolic Acid by an Australian Inventor—Recipe 224

TANNING WITH OFFAL.

Pyrofuxin, one of the Many Elements Found in Mineral Coal—It Rapidly Unites With the Tissues and is Retained 224
It Takes Twenty-eight Times as Long to Tan With Bark as With Pyrofuxin—Result of Experiments Made 225

LEATHER CANNON.

A Bit of History—Leather Cannon Been Tried on the Battlefield and Turned the Tide of One of the Greatest Battles in Modern Times—The Inventor 225
How Constructed—Battlefield of Leipsic—Easily Transported 226

WESTERN HEMLOCK.

Was Formerly Considered of Little Value—As the Pine Diminishes, the Hemlock Finds Favor—Twenty Million Feet Cut Annually in one County in Wisconsin—Eastern Hemlock Equal to White Pine 227

DISCOVERY OF A TANNERY FOUR HUNDRED YEARS OLD.

At Hamburg, Germany, When Excavating for Building Purposes, a Few Years Ago, Brought to Light a Tannery Supposed to be Four Hundred Years Old, in Which Were a Number of Hides That Have Been There, it is Estimated, 150 Years—They Were Bought by a Berlin Firm—Well Preserved 227

FROZEN LEATHER.

A Plausible Theory by V. Eitner, a Vienna Scientist, on the Effects of Freezing Leather—Frozen and Thawed Apples—The Writer's Experience in an Eastern Tannery—Loss of Weight 228
Freezing Beneficial to Some Kinds of Leather—Improves the Complexion and Kills the Horn 229

CHAPTER XVII.

VALUABLE RECIPES.

Grain Leather Dressing—Imitation Goat and Glove Black—Boot Grain and Harness Black—Scar Paste—Boot Top Liquid 231
Black Varnish—To Prevent Deposits of Lime in Boilers—Ink for Marking Packages—Liquid Shoe Blacking—Currier's Soft Soap 232
Harness Blacking—India Rubber Liquid Blacking—India Rubber Waterproof Composition for Boots and Shoes 233
To Clean Buff-colored Leather—For Softening Leather—Varnish for Boots and Shoes—For Calf Kid and Patent Leather 233
Cleaning Morocco Leather—Tawing Skins—To Prepare Sheepskins for Mats 234

Varnish for Tools—To Dye Leather Blue, Red or Purple—To Tan a Hide with the Hair On 235
Oil Adulterations—To Glue Leather to Iron—Glycerine Leather Polish . 236
Water-proof Composition for Leather—To Render Glue Insoluble—Black Lacquer for Shoes and Leather—Leather Belts 237
Water-proof Oil Blacking—Leather Cements 238
Boot and Shoe Soles Finish—Tanning Furs 239
Flour Paste—Gum tragacanth 240

LIST OF ILLUSTRATIONS.

Tanners' Hide Trim 3
Hide Wash Wheel 4
Lime Reel 5
Bate and Coloring Wheels 9
Kenosha Bark Crusher 17
LaCrosse Bark Shaving Mill 18
Belt Knife Splitting Machine 21
Union Splitting Machine and Friction Gear 22
Stuffing Wheel 25
Buffalo Liquor Pump 28
Square Liquor Logs 30
Pebbling Jack 33
Staking and Perching Machine 34
Ground Plan of Tannery 48
Key for Pinning the Hides 89
Bark Mills 104
Grubs or Warbles 164

LIBRARY OF THE UNIVERSITY OF CALIFORNIA

LEATHER MANUFACTURE.

CHAPTER I.

The manufacture of oil grain has become one of the most important industries in the leather manufacture, particularly in the West, and some of the largest tanners make a specialty of this class of stock. It has largely displaced the use of wax upper, kips and calfskins. It is practically a waterproof leather, but at the same time is very tough, pliable and durable. The hides intended for its manufacture are classed as heavy cows, running from 50 to 60 pounds, and are more spready than those employed for harness leather. A desirable pattern may be had from extreme light hides of 25 to 40 pounds, or still better, of from 30 to 50 pounds. The former is composed principally of young heifers, bulls and steers, which will yield some 31 feet of leather per hide and from 5½ to 6 pounds of rough splits. The latter weight of hides will show a larger percentage of heifers and cows, with a fair sprinkling of steers, but of a more spready nature.

It is not good economy for the tanner to work extremely light hides for this class of work, as the cost of labor per hide is about the same as those of greater average weight and measure. No more pit room will be required to work hides of 50 to 60 pounds where suspended on sticks than it takes for hides of 30 to 32 pounds average, as made from weights ranging from 25 to 40 pounds. Heavy cows will yield a greater percentage of measure per pound than those of a steery nature. Besides, the splits from spready cows are far more desirable for flesh finish, being finer in the flanks and of that larger pattern so desirable with shoe manufacturers in the cutting.

SOAKING AND LIMING.

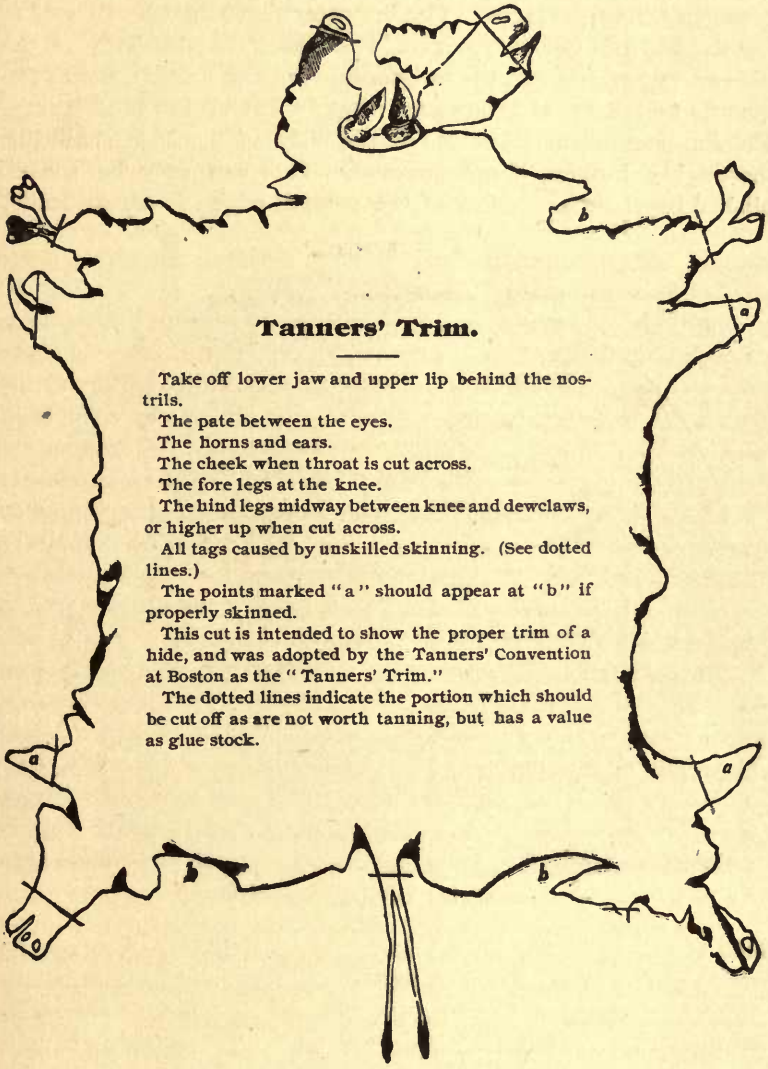
Given a basis of fifty heavy hides, or 100 sides, per pack. These I will practically carry through the beam-house, tannery, splitting and finishing departments. The dimensions of tannery pits for this number should be 8 feet long, 5½ to 6 feet wide and 5 feet deep. Those having the old style of pits of smaller dimensions can adapt themselves to the circumstances by dividing the number to

conform to the smaller capacity of the pits, giving ample room in the hanging.

Care should be taken when putting in the daily packs in beam-house to secure as near as possible a uniform run in weight of hides per pack, as the lime and chicken manure is weighed and measured out according to the number of hides in place of the number of pounds per pack. In some of the large tanneries each pack of hides is weighed without regard to numbers, and consequently packs vary by several hides when taken promiscuously from the hide-house. But it is better to carry along packs of the same number daily through the works, as it will enable the superintendent to keep tally of the hides and leather while they journey through the works or in taking stock of them.

First proceed to trim off all superfluous parts and throw them into the glue pile. These parts consist of the pates, fore and hind shanks, teats, tail and any unsightly portion which will not finish and make desirable leather. Too much care cannot be given to this branch of work at the outset; it is but a waste of bark and labor in tanning glue stock only to cut it off when the leather reaches the splitting and finishing room, where those unsightly pieces have but a nominal value. If the glue stock, so taken off, cannot be readily placed with the glue manufacturers it should be limed, to preserve it until such time as shipments can be made. (See cut on opposite page.)

Take ten hides, throw them into the wash-wheel, as per diagram page 10, and run the same for twenty minutes with a good flow of water through an inch pipe which is conveyed through the axle of the wheel. The supply may be regulated by a valve within reach of the operator. In case water cannot be obtained from a hydrant, place a large tank over, or at a sufficient height above the wheel, and by force pump fill it from lake, river, or well. If at the expiration of twenty minutes the salt, dirt and blood is not thoroughly removed, then continue the process until the waste water, which is expelled through the numerous openings in the circumference of the wheel, is practically clean. Then stop the wheel and take out the hides, spreading them, with the hair uppermost, on the floor. Then split them through the back strip, being careful to carry a steady hand and to have a smooth, keen edge to the splitting knife. Throw the sides into a vat, or pool (after splitting), of clear, cool water and let them remain for two days, where cold lake or well water is used.



Tanners' Trim.

Take off lower jaw and upper lip behind the nostrils.

The pate between the eyes.

The horns and ears.

The cheek when throat is cut across.

The fore legs at the knee.

The hind legs midway between knee and dewclaws, or higher up when cut across.

All tags caused by unskilled skinning. (See dotted lines.)

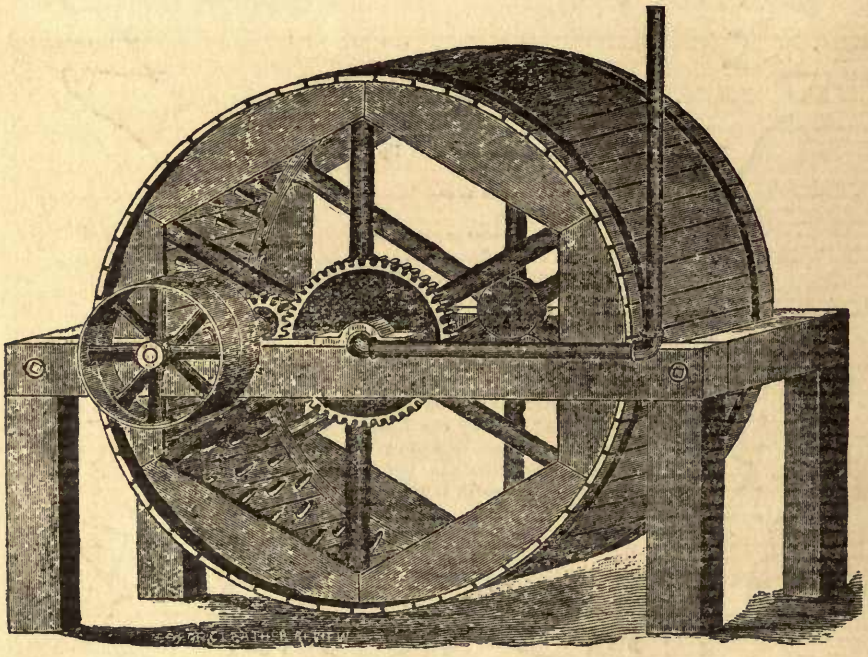
The points marked "a" should appear at "b" if properly skinned.

This cut is intended to show the proper trim of a hide, and was adopted by the Tanners' Convention at Boston as the "Tanners' Trim."

The dotted lines indicate the portion which should be cut off as are not worth tanning, but has a value as glue stock.

FLESHING.

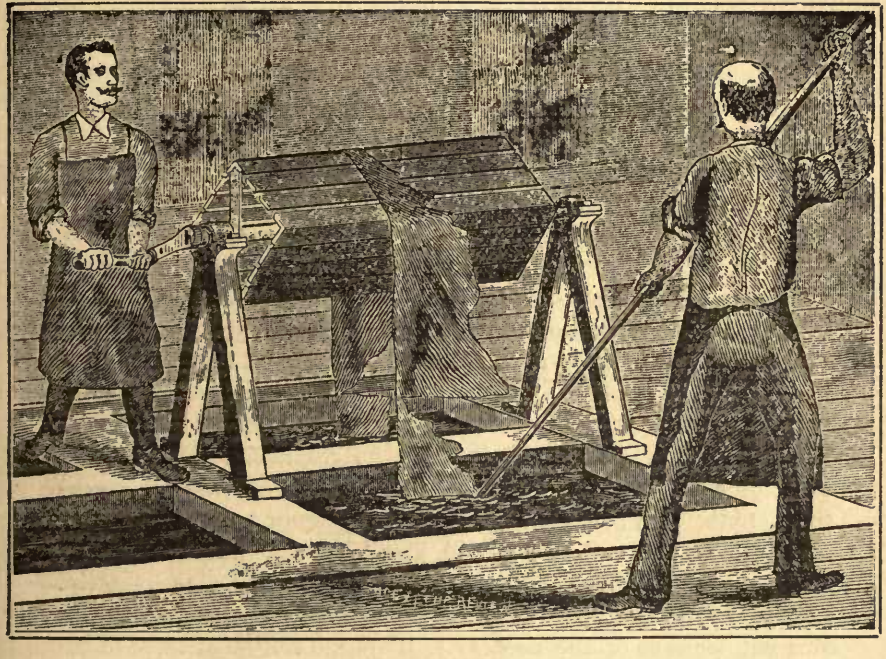
The beam hands, or beamsters, so called, may then commence the fleshing operation, which is one of the most important processes in the early stages. The beamster should not be allowed to use the sharp, or cutting edge of the flesher on the body of the hide except at, or near, the tail, flanks, or head portion, where frequently an excess of tallow and meat is left on in the skinning. The innumerable small nerves on the body of the hide should be thoroughly broken, if not removed. This can only be accomplished by vigorous strokes of the smooth edge of concave knife.



WASH WHEEL.

Such action is highly important, for should these nerves not be broken at this stage, the hide will ever after present a contracted, baggy appearance, and besides, it will be found difficult to force the tannic acid to the cells from the flesh side. When the nerves are fully broken the hide becomes relaxed and has a more supple, flaccid feel and appearance, and will readily adapt itself to all the subsequent manipulations in the tannery and finishing room. After the hides are fleshed they should be again put into the wash-wheel and run for a few moments until the remaining blood and dirt ex-

posed through the process of fleshing are completely removed. The beamsters, when fleshing, should be instructed to cut a slit near the head and tail, one and a half inches long, for the purpose of pinning the hides together before going into the lime. Each beam hand should also have his number or initial to stamp on the lower butt portion, in order to identify him should any question arise as to poor workmanship in the fleshing and fine-hairing. The purchase number of each lot of hides should also be stamped near the tail of the hide. This will be found very desirable in furnishing proof of the quality, condition, and yield of each and every lot



LIME REEL.

purchased. It is done by the man of all work in the beam-house, at a time when the hides first come from the wash-wheel for splitting. If B and No. 2 hides are purchased, B and C may be stamped in connection with the number of lot.

LIMING.

The hides after being fleshed and washed in the wheel are then piled down near the lime pit, and are doubled in the center with the hair out. Wooden pins, or keys, some three inches long,

three-fourths of an inch wide, and three-fourths of an inch thick, are used for connecting the hides together. In the center of each key a mortise or slot one-half inch long, and about the same in depth is cut, and both ends of the key are tapered off. When ready to go into the lime pit, pull the cut slip from the head of No. 1 through the butt of No. 2, and insert the key. Continue the same method until the entire pack is keyed together, and throw each into the pit when connected. The first and last hide going in should have a float, a piece of wood, tied firmly so that the operator, when reeling over from one lime to another, will readily discover the top hide and pass the float attachment over the reel, when, with little labor, the entire pack may be changed in a few moments. There should be one man to turn the reel, and another, with pole in hand, to evenly distribute the hides in the pit. (See cut of reel.) The packs should be changed daily, the top hide of today, for instance, should be the bottom hide of tomorrow, and this rotation should be maintained during the liming process.

When working extreme light hides, averaging thirty to thirty-two pounds each, 100 pounds of stone lime will be required to carry the pack of fifty hides, or 100 sides, through the liming process, take off the hair and sufficiently swell and remove the required amount of gelatine in order to produce supple, pliable and plump leather. Where heavy cows are used it will not require a corresponding amount of lime per pound of hide as this class of hides is of more open texture and more readily penetrated by the caustic lime. To be on the safe side it is well to commence on the basis of six pounds of stone lime to every 100 pounds of trimmed, green-cured hides. When making a new lime liquor a greater number of pounds of lime will be required, say fully one-third more. In this the foreman should be the best judge, not only as to quantity, but also to the quality of lime used, which varies considerably in different sections of the country. It should not be allowed to become air-slacked, as then much of its properties pass away through exposure. Be sure to avoid too high liming; it is far better that the hair should require some exertion in the removal than to slip too easily, even though the beamsters complain of having to use more elbow power in unhairing. The capacity of the lime pits should be about the same as the liquor pits, with conveyors at bottom to pass off, when needed, all impurities to the sewer or river. Limes should be cleaned frequently, as the daily introduction of green hides will eventually turn the lime into a soak, absorbing

the large amount of blood, ammonia, etc., which work out of the hides when they are in the reduced condition in which they enter the lime pits. The lime should be thoroughly slacked and reduced before going into the pit, by moistening with warm water, if convenient. All sediment should be retained in the tub and thrown on the manure heap. Six to seven days will be ample time to plump the hides and remove the hair. Commence first in pit No. 1, which should be designated as the "dead" pit, and No. 6 or 7 the "live" pits, which should be the strongest yet. There must be a gradual up grade from No. 1 to Nos. 6 and 7, and the amount of lime thus slacked for the daily pack should be put into the pits as the hides are changed from one pit to another.

It is not as important that hides should go into as correspondingly weak solution of lime in the first process as when they go into the liquor pits. Still it is better not to commence with too strong limes in the first immersion, but in every change made in reeling from one lime pit to another, the lime liquor should be further strengthened until reaching the head or "live" pit, and it should be of sufficient strength to complete the work in hand. Openings in the pits at top center will be necessary so that in reeling over from one to another the flow of liquor may equalize itself. Pit No. 1 need not, consequently, be strengthened, as the flow backwards from the stronger limes will be ample for all practical purposes.

UNHAIRING.

At the expiration of the time stated, reel the oldest pack of hides on top of the preceding pit, remove the keys and then throw the hides into a hot water bath prepared for them, which may indicate a temperature of from 100 to 110 degrees, and then unhair after they have been allowed to lie for two or three hours. This bath will tend to further swell the hides, and cause the hair to slip off more readily, and at the same time will remove from the pores and cells the caustic lime which would necessarily have to be neutralized later on in the bate wheel. The unhairing should be done by a smooth, stunt edged knife so that the grain may not be marred, as any imperfections at this stage will show up quite prominently after being tanned. The hair and epidermis must not only be removed but a good hard working of the grain should follow. This will remove in a great measure the lime and filth, and save time and expense in the bating process. After unhairing, the hides must be again thrown into the wash-wheel where they should

run with a liberal supply of water for ten minutes to remove adhering hair, lime and dirt before going into the bate.

BATING.

Much depends on the condition of the hides, the water, and the weather as to the required time to deplete the hide, neutralize the remaining particles of lime and leave it in good condition to enter the tannery. In making a new bate from clear water, nearly double the amount of chicken manure will be required, but when, once fully ripe, three bushels of chicken manure, previously soaked in a barrel of warm water and fermented, will be found sufficient to deplete a pack of 100 sides of extreme light hides. But good judgment will be required in this particular branch of the work. There will be noticeable a great difference in manure as gathered from poultry raisers. If it contains a fair percentage of dove manure it will be found to be of greater strength. Again, chicken manure gathered during the winter months does not dry when dropped as it does in summer, but freezes and thaws, and thereby loses a good proportion of its ammonia properties which is so important an agent in reducing the hide and fitting it to readily unite the gelatine with the tannic acid.

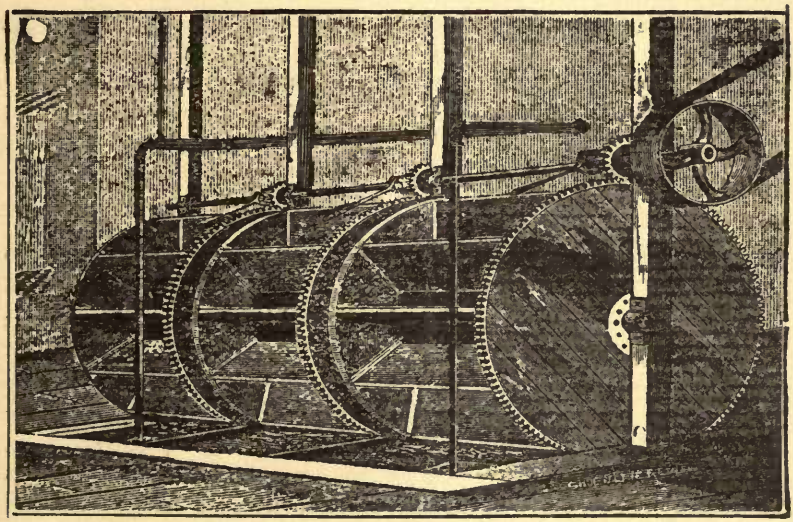
The greatest enemies the tanner has to contend with are lime and tannic acid. Numerous inventions have been put on the market as a substitute for chicken manure, so generally used since the days of the Biblical Simon, some of which will without doubt, be as generally adopted in the near future, as the more intelligent and enterprising tanners of the present are employing every means known to science and chemistry to do away with old time methods and make the tannery a sweeter smelling institution than has characterized it in the past.

The bate-wheel after the complement of manure has been put in, should be heated to a temperature of from eighty to ninety degrees. The hides after coming from the wash-wheel are then thrown into the revolving wheel and run continuously during the day, or until such time when every trace of lime is neutralized and the hides reduced from their former rigid condition to one of mellowness, giving to the grain a fine silky feeling. By drawing the thumb and forefinger across the body portion the condition may be readily ascertained, or it may also be discovered when the indentation of the finger nails can be plainly traced on the mellow grain. No given time can be stated for properly bating the hides. This must be left to the judgment of the operator or foreman.

Care should be given that the bating may not be carried beyond a certain stage, for in a few moments' time after the hides are thoroughly depleted putrefaction sets in, first showing on the flesh side which will commence to peel off by a gentle touch of the fingers. Following immediately after, the grain becomes pitted with what are well known to the trade as "bate pricks," easily discernible, though no larger than pin-heads, but which effectually destroy the hide for grain leather purposes. No time must be lost in forwarding them to the bark liquors to prevent further decay.

WORKING OUT THE BATE.

The hides are taken from the bate-wheel, as needed for working, and thrown into barrels of warm water, placed between the beamsters, from which they are placed upon the beam, grain up, when a thorough working is given, removing all remaining hairs from



BATE WHEELS.

body and edges, and forcing, through vigorous applications of the knife, the lime and filth from the pores and cells. The knife for this work should not be too stunt, nor sharp enough to injure the grain, but in a condition to hug the grain in a manner to entirely free it from all foreign matter.

One important feature has been overlooked in the liming process, that of steaming up the lime pits in a similar manner to that of the bates. Extreme heat should, under no consideration, be applied to the lime liquors. The temperature should not exceed seventy de-

grees in winter, and no steam whatever should be applied during the summer months. Hides will swell and plump up more effectually in cold liquors than in warm, and numerous cases, supposed to be caused by animal disease, of pimples on grain and flesh, and, not infrequently, white spots intermixed with the solid gelatine, may be traced to the evil of steaming up the limes. Natural heat is all that is required to lime the hide properly, except in cold weather where water is pumped from lake or river when a higher temperature is required to facilitate the work, but excessive heat is not only impracticable, but injurious to the hides.

The pack of hides having been fine-haired, or, what is more familiarly termed among Eastern tanners as having been "worked out of the bate," and "drenched," instead of "bating," as Western tanners apply it, are then given their final washing in the wheel, when a bountiful supply of clear, cold water is run in. The wheel is put in motion for ten minutes, and the hides, during that period will plump up considerably from the cold bath and are then in excellent condition to go into the coloring wheel.

CHAPTER II.

COLORING OR SETTING THE GRAIN.

The pack of hides is then taken to the coloring wheel, similar to the bate-wheel in construction, which is supposed to be in close proximity to the beam-house. Their first immersion in this wheel will slightly contract the grain or cuticle and remove the former silky feeling as when coming from the bate. This wheel, like the bate-wheel, has a cylindrical bottom, allowing a continuous revolution of the hides through the force of the wheel buckets, which are submerged to the depth of some twelve inches, and making fifteen revolutions per minute, or just sufficient to maintain a continuous current from bottom to the top. Liquor for this work should not indicate over five degrees density, barkometer test, or a third run liquor from the leaches, but should be sweet and pure. In this liquor allow the wheel to revolve not to exceed ten minutes when the pack should be taken out and connected with the sticks for suspending in the pit.

It has been the custom of many tanners using the England handling wheels, to run the packs in them for hours at a time in a weak and often sour, ropy liquor. Consequently many have practically abolished their use, having become convinced there was great wear

and tear on the coarse flanks and loose portions of the hides, and later on it was found to be an impossibility to produce the desired full, plump flanks, so important in the manufacture of oil grain, buff and glove leather. A clear, pure liquor is very essential in the first stages · it should be cool and be run directly from the leaches.

First impressions are more lasting, whether in making the acquaintance of a blushing young lady or in making leather, the latter, in fact, should receive the same delicate hue or bloom as on the maiden's cheeks. Where weak and impure liquors are used the grain is of a dull, brownish color, streaked and unsightly, and all the after manipulations will fail to eradicate those eye-sores that mar the complexion of your leather.

Where ample room may be had in the pits for suspending, the coloring in wheel may be dispensed with, but in warm weather it is safer to use the wheel for a few moments for the purpose of preserving the cuticle and flesh until the hides are fairly plump in the liquors. This is done in order to prevent any injury to grain or flesh, particularly those portions coming in contact with the sticks to which they are secured.

SUSPENDING.

For this work pine or ash sticks three inches wide, one-half an inch thick and within one-half inch of the length of the pits are used. Bearings, two inches thick and four inches wide are strongly spiked at each end of pits and six inches below the top, thereby allowing a sufficient amount of liquor to cover the sticks and backs of hides during the feeding process. The pack of hides, as taken from the handling wheel, are placed with the grain side up, and backs to the front, on a table near to the pit in which they are about to enter. The sticks are prepared in the following manner, which will be found quite handy in connecting and disconnecting the sides without the use of nails, thereby preventing abrasions or imperfections on the grain side when changing from one pit to another. To make connections, take small brass screws of the size of common wire and about two inches long, with a gimlet thread attachment, and put the screw in the bottom center of the stick at a slight angle, so that the hook portion may project near the outer edge of stick and about one inch below. On each end of the sticks, in the center, bore a small hole and connect them by a stout cord leaving the ends to project some twelve inches, or at least to a sufficient length to connect with the side so as to tighten the same

after it has been fastened to the brass screw in center. The first connection is made on the center screw, the operator having a small hand spring punch with which he punches the hole, about one-eighth of an inch from the back center strip. The stick is then placed on the back strip and the side connected to the brass hook. The slits, cut at each end of the hides by the beamsters for the purpose of pinning them together for reeling in the limes, come into good use for the suspending. The cords at each end of stick are put through the slits and drawn not too tightly, but slightly, and are secured by a single bow-knot. Care should be taken not to tighten the cords too firmly, for the hides when in progress of tanning will naturally contract, and should the cords be strained unnaturally the backs of the hides will curl so closely that the tannic acid will fail to penetrate them, as it does the more exposed portions; and when taken to the splitting room streaks of green hide will be noticeable and frequently the flesh in such cases perishes for want of nourishment.

For this reason I recommend the handling in wheels before the hides are put into the pits. One man, after he has become familar with work, can, in thirty minutes' time connect the pack of hides to the sticks and place them in regular order in the pit, and once in the labor is trifling during the journey through the tannery. The same man can easily perform all the work in the tannery, including the changing of liquors and packs, the taking off the leather from the sticks wherein one hundred sides, or one pack of hides go in daily, and the number going out to split.

ARRANGEMENTS OF PITS.

When it is convenient, or when the tannery is in close proximity to the beam-house and handling wheel, it will be more practicable to commence putting in the packs, as for instance, in pit No. 1, so designated, and carrying them along daily so that the first pack coming in from the beam-house may go into the same pit as the pack taken out for splitting at the other end of tannery. As no two tanneries are alike, in location of pits or numbers, no definite plan can be mapped out for the changing or carrying forward of the packs, still, I would advise a daily change of packs until they have been in at least fifteen days, and I should give them entirely new and sweet liquors daily, increasing the strength as changes occur. Never under any circumstances allow the hides to "fall away" for want of sufficient nourishment, as hides, like children, must be fed often, and as they grow in strength and age require more nutritious

food. There is, however, as much danger in overfeeding, as in starving. Should liquors of too great strength be used in the first stages, the pores of the hide become clogged, producing tinny and crusty leather, and, in a great measure, the inner or more gelatinous portions are prevented from receiving the proper supply of tannic acid, and this causes, more particularly when the liquors are warm and of too great density, what is known as "Black Rot." The safer way is to introduce weaker liquors, during the first stages of a temperature not above 60°, and frequent changes should be made. After the hides are well "struck," or when a good percentage of the gelatine is united with the tannin, then heavier liquors, which will give the pores and cells the needed filling, may be safely introduced.

For upper leather purposes, liquors of no greater strength or density than 12° need be used, such for example, as are taken from a first run from a fresh ground leach of bark by the ordinary method of leaching. I am aware that many tanners use liquors in the handlers and lay-a-ways of 20° and upwards, but I challenge any such to produce as good, tough, and serviceable leather as in cases where pure liquors of not over 12° are used, provided that these liquors are changed frequently, and that successive courses are stronger than the preceding ones. Then not until the last two weeks of the immersion of the hides should the first run be given, and on receiving it the pack may be allowed a rest of from three to four days without changing, thereby giving the hides a little respite to ripen up in their quiet retreat. The leather, by thus resting, will also plump up and bleach through the accumulation of gallic acid resulting from the decomposition of tannic acid. This result may be more effectually accomplished by their being laid away and permitted to remain for weeks and months, as is frequently done, at great expense of the tannic acid, but such a method should be considered impractical, in either upper or sole leather, in this closing period of the practical Nineteenth century.

It is a well known fact that as good, if not better gains have been made in sole leather in six hours liming, and three months tanning, through frequent change of liquors, than have been made by two weeks liming and from nine months to one year or more in the tanning, by the old method of laying away. The cost in labor, from the frequent handling, will be greater, every tanner will admit, but when the lessened amount of bark by scientific grinding and leaching has produced a sweet, pure liquor, free from gallic

acid, and the lessened time required to turn the stock is taken into consideration, the gain in the latter method will more than offset the extra expense in frequent handling. The two processes might be compared to "the long and short haul" clause in railway circles, but favoring the short haul or quick-time method. I would therefore advise tanners, making oil grain and other grades of fine shoe stock, which the writer will deal with in future chapters, to handle frequently and to change the liquors at the same time, until the leather is well "struck." Then consign those packs to the relief corps, or to a reserved portion of the yard, so that the forthcoming packs may go along in regular order until they reach maturity, and thereby enable the others to obtain a quiet rest for a few days to ripen up.

TIME REQUIRED.

For soaking, liming and bating we give about eleven days in the beam-house, including the labor, milling, etc. In the tannery not over twenty-seven days will be required to carry the hides through to completion, with possibly a slight streak of hide in the thick joles of plump steers or cows. The sides, after splitting, need not be returned to the tannery, but the splits must go back for their final filling, to give them additional heft, as only this portion is sold by weight.

For light, spready cows the time will materially differ in carrying them through the works, as many of the extreme light hides are far more plump and stocky than spready cows, being largely composed of young steers and bulls, having thick heads and flanks, while in straight cow selection those portions are very uniform in substance, and will produce a greater number of feet, in proportion to the weight, than steers and bulls. It is a mistaken notion, some few tanners entertain, that extreme light hides will produce a greater percentage of finished leather than those from selected cows. Could the tanner buy a straight selection of young heifers from the extreme light hides, as also the light cows, by even paying one-half cent more per pound, he would undoubtedly be the gainer, as this class of hides make a very desirable pattern of leather for the manufacturer of fine shoes. But, as was before stated, those hides, taken as they run, are largely composed of young steers and bulls, and not unfrequently the bull heads are cut off by dealers, who pass them off on the unsuspecting tanners for steers. Further, the small steers are often found trimmed on the flank portions, near the hind shank, so that their pedigree may not

be traced, which enables the dealers to sell them for young heifers. Consequently, I repeat, that cow hides of desirable pattern are better adapted for this class of work, as one hide will not occupy more space in the tannery, stuffing or finishing lofts, than a small heifer or steer hide. It costs but a trifle more to beam, handle, split, shave, scour, stuff, set, or finish a side of straight cow stock measuring 22 to 24 feet per side, than it does one measuring 15 to 16 feet. Besides, if the leather be tanned properly, by suspending as recommended, the flanks will compare favorably with those of much smaller proportions, and shoe manufacturers can cut their patterns more economically than from a small hide. Though it may appear strange, it is nevertheless true, that the skinning of large hides is done more scientifically than that of the small ones, and the former are also much freer from barb-wire scratches. The older cattle having learnt wisdom, shun the barb-wire fence, after two or three sad experiences in infancy, and give it a wider berth than do the younger cattle, who frequently get on a rampage and cover themselves, not with glory, but with barb-wire scratches, from horns to tail.

The writer has had ample proof of this in the working of each class of hides, and has been at a loss at times to know where to consign those defective hides in the endeavor to make fine grain leather.

As recommended, the pack of hides should be changed from pit No. 1 the day following that wherein was prepared a cool liquor of from three to four degrees, barkometer test, and should be carried over into No. 2, wherein a fresh liquor has been run from the leaches, of slightly increased strength. This method should be continued daily, keeping continually in view the fact, that as the tanning progresses, the strength of the liquor should also increase until about the fifteenth day, when liquors of ten degrees can be used with safety and without fear of the leather "falling away" for want of sufficient nourishment.

The changes of packs can be done by one man as follows: Place a wide plank the length of the pit, resting on each end of the strips mentioned for supporting the pack, having previously run off the exhausted liquor to the junk for repumping over to the leaches. A similar plank is also placed in pit No. 2; then the operator steps on to the plank in No. 1 and taking two or three sides at a time carries them over into pit No. 2, which is supposed to be partially filled with liquor, and then carefully lower the sides by a vibrating

movement from right to left so that the flanks may be opened out to receive the liquor, and when the entire pack is changed, run in sufficient liquor to entirely fill the pit. It is also advisable to take a plunger at intervals and agitate the liquor as the more dense or astringent portion settles at the bottom of the pit. This tendency, however, produces favorable results even though the agitating movement be dispensed with, and is the prime cause in the production of full, plump flanks to the leather which cannot be secured by the old method of throwing into the liquors promiscuously, or by laying away in bark. Keep an eye to the loose, flanky portions, and the fine textured body portion will take care of itself.

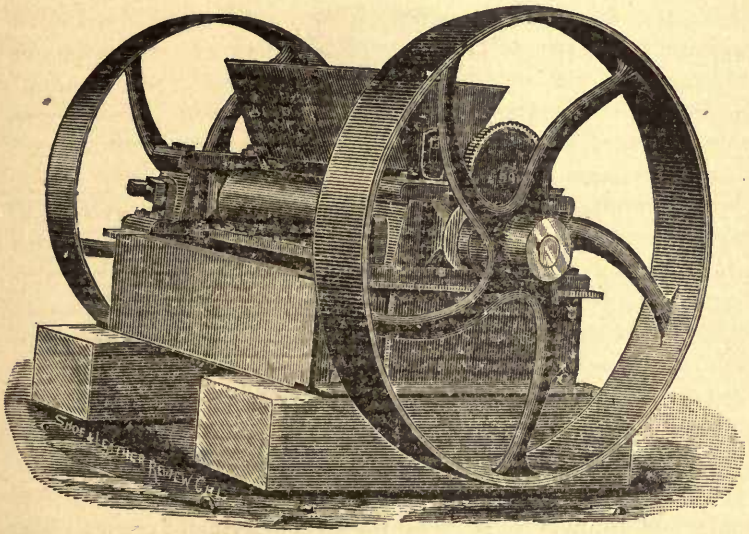
By suspending the hides every portion has ample space to feed, and will more readily exhaust the tannic acid; for this reason, I would insist on frequent changing of hides and liquors until such time as the packs are out of danger, when they may remain quiet for several days in a fairly strong liquor for plumping and ripening. This process is far preferable to the old method, where hides are thrown into the pit, one on top of the other, and when the whole pack is in, they are practically in a solid body, one lapping on the other, requiring frequent pulling out by hooks, so that the liquor may have access to those parts most requiring it. In laying away, this objection is greatly overcome, as a bountiful supply of ground bark is spread over each side allowing ample space for the liquor to penetrate, but at the same time failing to produce the desired result in the flank portions, as the suspending method does.

The time required to practically prepare the leather for splitting, by suspending, should not exceed twenty-eight days, when the leather, if changed as recommended, will be struck through and well filled for the class of work for which it is intended, as oil grain to be tough and pliable does not require the same filling of pores and cells as do wax upper, kips, etc., finished on the flesh side. The pack is thrown on top of the next pit, but previous to this the liquor should be run off to the junk, and a hose with nozzle attachment, supplied with either water or spent liquor by force pump, and forced between the sticks, completely removing all accumulations of gallic acid, fine dust and dirt, that have accumulated on sticks, sides and pit, passing the same through conveyor to junk, the same to be pumped over on a last run leach of bark and strained off for future use on a fresh ground leach. The pack is then taken out of the pit and will be found in good and clean con-

dition for sammieing and splitting. The sticks are detached from the sides and the leather is then taken to the lofts and hung on sticks to partially dry.

PREPARATION OF BARK AND AMOUNT REQUIRED.

If tanning extremely light hides, two and one-half cords of hemlock bark will be found ample to tan the pack of fifty hides or one hundred sides, and also for the splits, whether finished or sold in the rough. The sides after splitting need not go back to the tannery again, but should be treated according to the instructions given in the following chapter. The splits require a good filling of bark after being taken off, and are first run for thirty minutes in the drum-wheel, with just enough gambier liquor of fair strength,

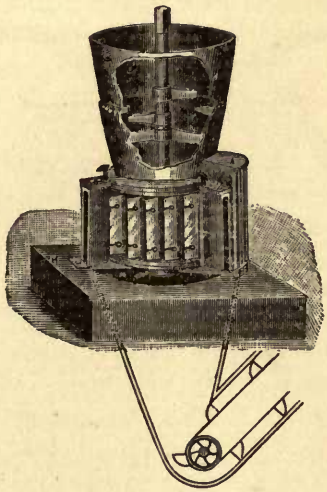


BARK CRUSHER.

to put them in good condition to go into the tannery for completion, which can be accomplished in about ten days. To save frequent handling throw them into an England wheel, and run the same daily for a few minutes at a time or for only a sufficient period to change the position of the splits and liquor. The latter may be run off and fresh liquor run in without pulling up the pack. This will be found necessary, as on first immersion weaker liquors should be used. For spready cows, fifty to sixty pounds, will require about one cord more of bark per hundred sides, or from three and a quarter to three and a half cords per pack.

GRINDING AND LEACHING.

The most practical and economical way, to the writer's mind, for preparing the bark for leaching is by crushing, but the immense power required and the consequent friction, have prevented it from being more generally applied. Still, this method is used by many, the bark being first ground coarsely in a common mill, thence passing into the hopper or crusher when the kernels run through powerful rollers, that thoroughly crush the cells and then pass into the conveyor in thin leaves or flakes, and what little dust accumulates in the grinding is firmly packed within the scraps of crushed bark. These scraps may be reduced to powder by the simple pressure of thumb and forefinger, but when in the leaches they swell like a



BARK-SHAVING MILL.

sponge and are held together by the interweaving of crushed fibers thereby preventing packing in the leaches, and allowing free passage of liquor in the running off.

The tannic acid can be readily extracted and with little if any steam used in the process. There are other mills receiving a good share of attention which shave or plane the bark diagonally across the cells, the product being in the shape of shavings which lay very light and spongy in the leaches. A saving of some 25 per cent, it is claimed, is made over the old method of grinding. Either of these mills is a decided improvement, and both are saving the tanners much money in their use.

Every tanner has his own method of leaching bark and the

number of runs from such leach secured. The conveyor system of carrying the bark from mill to leaches, and the spent bark to the fire-room, has its advantages over the floating system of the bark from the mill, as by this the spent bark cannot be disposed of as readily and cheaply. The press system of leaching is more generally adopted, as by it purer liquors are obtained. The pumping over of exhaust liquors on to head leach, the same passing through and forced from bottom of No. 1 to top of No. 2, and so on throughout the entire system. By this system the bark is almost continually being percolated, the liquors purified, and of greater density than where the leaching is confined chiefly to that in which the bark is ground. A few tanners have suitable facilities and ample steam capacity for heating their liquors to a very high temperature, to boiling heat, and then pass the liquor into coolers before going into the yard. By this means all foreign matter is extracted, and what has not passed off in vapor will form in scale, similar to that produced through impure water in boilers, and when filtered through the several leaches, as by the press system, practically if not virtually, may produce pure liquors. But where the tanner uses heat less than boiling point, leaving all the impurities in the bark and liquor, he will find it detrimental towards producing a good, healthy color to the leather. On this principle some men take pills or medicine to clear their livers of bile. If the dose is not sufficient to fulfill its work the patient finds himself worse than before, as the bile has been stirred up pretty effectually, the same as water or bark liquors at a too low temperature, but not sufficient to pass off either steam or bile. Therefore, it is safer for the tanner, not having ample facilities for steaming, cooling, etc., to use only medium warm liquors, which are secured by running the spent liquor from junk to leaches, through the exhaust steam box, until the oldest leach is about ready for pitching, and then run on clear water and steam up the same, using the washing to run over on a fresh ground leach.

CHAPTER III.

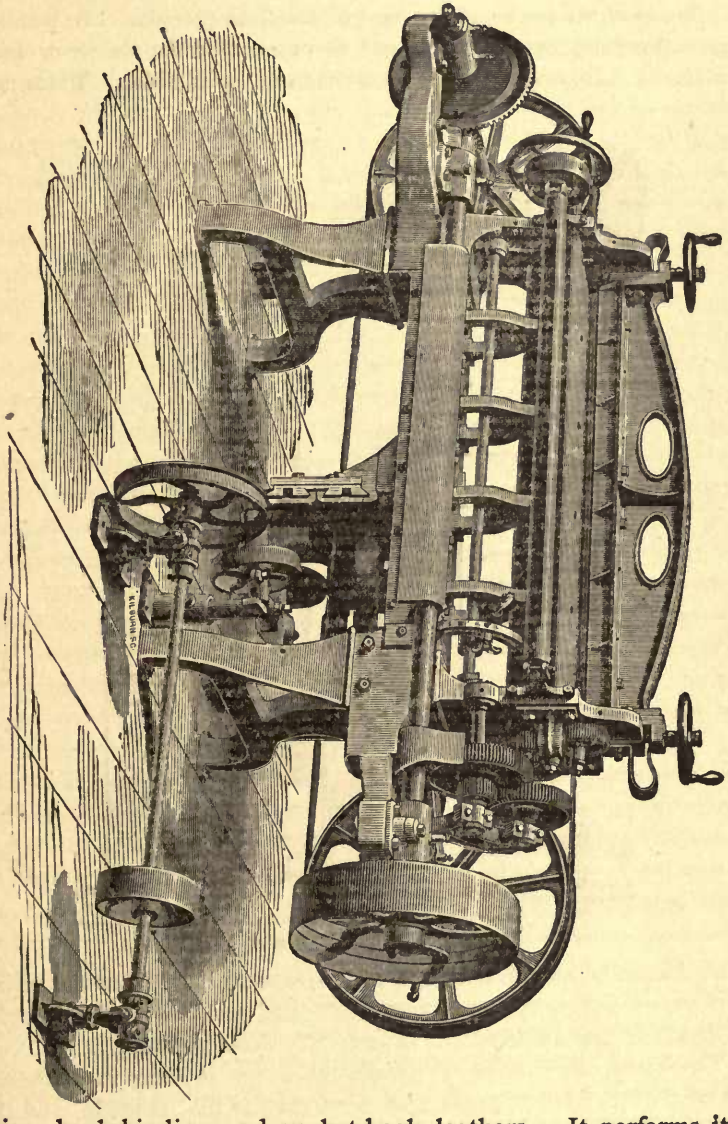
PREPARING FOR SKIVING.

After being sammied, take one side at a time and lay it on the table and dampen it, with a sheep-skin swab and water, to a uniform condition. Trim off all the superfluous parts, and scar all imperfections of the grain, then go over the grain side with a light dressing of cod and paraffine oil, with two-thirds of the former to one-third of the latter oil in the mixture. When the pack is completed take, for example, twenty-five sides, according to the dimensions of the wheel, which, if built in similar proportions to the stuffing-wheel, will be eight feet in diameter, four feet wide, inside measure, and will contain oak pins irregularly studded and inserted in the circumference. Such a sized wheel will have a capacity for the number of sides specified. No water or steam connections are required for this work. Put in the sides and connect the belt running around the center circumference of the wheel to the pulley, then apply the tightener, and set the wheel in motion, and run it for twenty minutes in the same condition as was taken from trimming table. This pin-blocking process will give to the leather a mellow feeling, and to the sides their natural contour, for after the hides have been suspended to sticks and hung in the pits for four weeks, supported only in the center and at each end, they change their original shape on the back strip through contraction in the tanning process. But during this milling they resume their former character and are more easily manipulated by skiver, splitter and shaver.

SKIVING AND SPLITTING.

If the belt knife machine is not at hand, recourse may be had to the revolving or thumping machine for removing the flesh. This has hands at intervals, with stone or steel slicker attached, and is of similar construction to the polishing machine. If neither of these machines is at hand, the operator will have to fall back to skiving by hand, with head knife over a stake. But I consider the belt-knife machine far ahead of anything yet invented for this work, as it is capable of doing five hundred sides daily. The skivings, as taken off, greatly resemble a lace shawl, and have greater value than hand skivings for shoddy work. There will not be found cuts and stabs as in hand skiving. In skiving by machine the sides are reversed from that of splitting, being fed into the machine flesh uppermost, the uneven portions passing downwards, while the flesh is separated uniformly on the entire surface

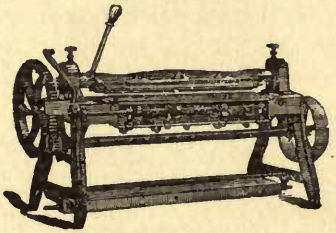
of the side, and, if required, the blood veins may be removed in a measure, where the splits are to be used for flesh finish. This machine is also a great favorite with tanners making light and fancy



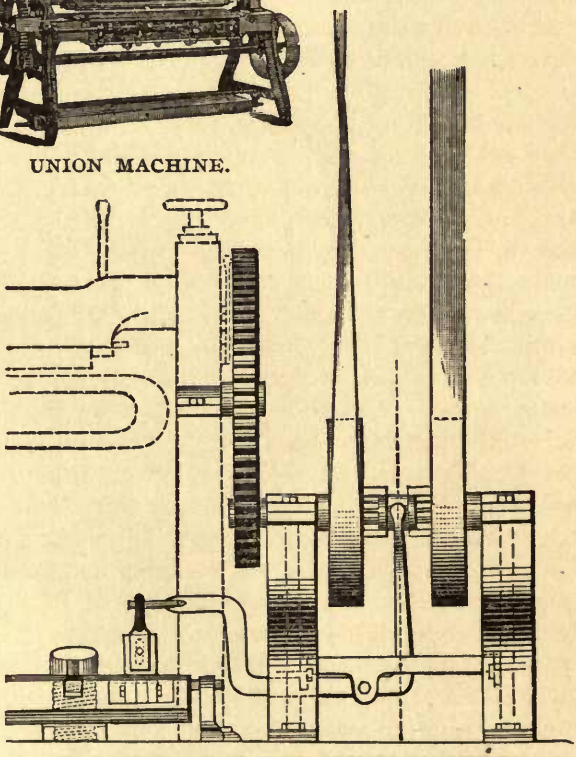
THE BELT KNIFE MACHINE.

grains, book-binding and pocket-book leathers. It performs its best work the nearer the belt-knife comes to the grain, and the leather requires no shaving as that split by the union machine. In

heavier grades of leather, such as wax upper, heavy boot grains, and collar leather, complaints are made that it will not perform its work as satisfactory as on light. Yet the writer has operated it on all classes of leather and with highly gratifying results. In leveling splits for flesh finish, the union machine will do its work more evenly in removing the slab from grain or split side. Then take



UNION MACHINE.



FRICTION GEAR FOR UNION MACHINE.

them to the belt-knife machine and remove a skiff from the entire surface, of sufficient size to split the veins, and this can be done far more safely and evenly than is generally done by hand.

The belt knife is more generally used for skiving in tanneries where leather of five ounce and upwards per foot is made, and the splitting is done by the union machine. One hundred sides per day of large oil grain are considered to be a good day's work for a union machine splitter, including the trimming of heads and shanks,

whereas with the belt knife two men can split from four to five hundred sides daily, and at the same time secure larger splits and a greater percentage of offal.

SHAVING AND RETANNING.

If split by a union machine the sides will have to be belly-shaved, but if done by the belt knife no shaving will be required. In splitting it is well to make three selections, throwing the light or spready sides in one pile, the medium in another, and the heavy by themselves; then the splitter can keep his gauge more uniformly and produce the desired classifications of leather to finish, ranging from three to five and six ounces per foot.

RETANNING.

Dissolve one bale of 250 pounds of gambier in a cask containing seventy-five gallons of water, which is connected by steam and water pipes, and is within reach of the drum wheel. This wheel is similar to the one described in the preceding pages, and is constructed on the same plan as the stuffing wheel. It is set up in splitting and scouring room. After the leather is shaved, put within the wheel thirty sides and five gallons of the gambier liquor, and about two-thirds of a water-pail full of dry American sumac; then add two or more pails of water, or bark liquor, according to the condition of the leather, or no more than what the leather will absorb during the milling process. Run on the belt and tightener and let the wheel revolve for thirty minutes. Take the leather from the wheel and pile down with flesh up in the box at the rear of the scourer's table, allowing the same to lay in pile ten or twelve hours before scouring. The cost of retanning, as above, will not exceed 4 cents per hide. Far better results will thus be accomplished in the space of thirty minutes than would be in an open pit in several days. Where hemlock tanned leather is used for grain finish it will fade and grow rusty in the black by age, unless sumac and gambier are used in retanning, after it has been split. Oak extract will answer the same purpose, and may be used alone with good results.

SCOURING.

The scouring may be done by either the hand or the machine, and only upon the grain side, and should be done thoroughly by stone and slicker. While at full spread on the table take a swab with cod and paraffine oil, mixed, and apply a light dressing to the grain; then fold in book form and hang in the loft for sammieing.

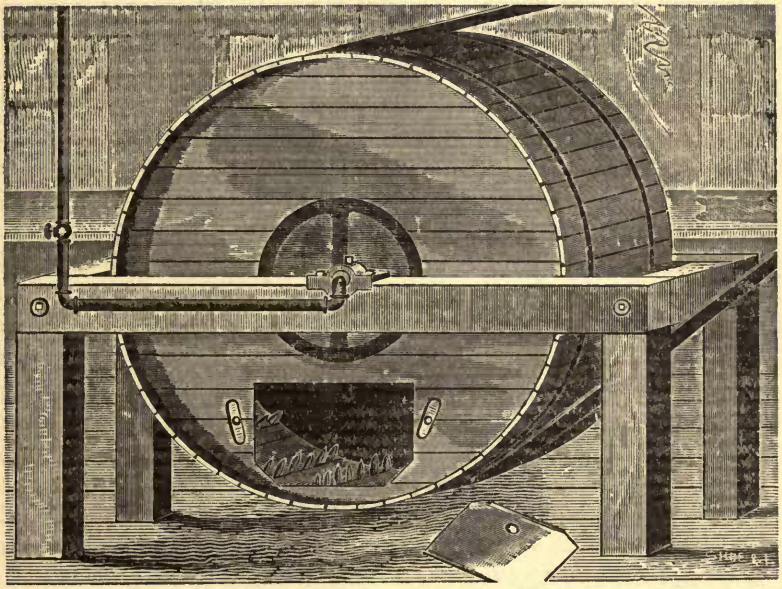
SAMMIEING.

This term, like many others which are employed by tanners, I have failed to learn the origin of, neither can such a word be found in the standard dictionaries. It appears to have originated in the Western and Southern states, for at the East, "hardening" is generally used when the leather is hung on poles or in the lofts to dry out a certain percentage of moisture, in order to prepare it for splitting and stuffing. Many tanners dry the scoured leather completely, then weigh up in packs, for the stuffing wheel the exact number of pounds for each wheel before dampening. Where ample drying room and steam is at hand I would advise tanners to adopt this method ; otherwise, practically like results may be obtained by only sammieing or hardening the sides. Then take a swab with water and carefully go over the dry spots, so that the side may be of uniform moisture, in place of immersing the sides as when completely dried out. To obtain the dry weight of leather sammied and dampened, deduct one-third from weight when ready to go into the stuffing wheel. This is a pretty sure guide where the leather is dampened by an expert. Too much attention cannot be given to preparing the leather at this stage for the stuffing wheel. It must be neither too wet nor too dry. If too wet, it will be found difficult to force the grease within the pores and cells ; if too dry, the grain will be disfigured, and the leather will have a ragged feeling in the finish. A good test is to fold the side on thick portions and give a good pressure on the grain with thumb and forefinger, and should water gently ooze from the pores, it may be considered in good condition for receiving the grease. The flank portions should be a trifle damper than the body, as it is important that the coarser parts should be thoroughly filled with heavy grease, to secure firm leather, as leather well dampened will carry more grease than where too dry, though it requires longer time in the wheel, and a higher temperature to expel the water from the pores before the grease can replace it. After dampening, the leather should be packed down in snug piles, covered over with wet leather and allowed to remain thus for twenty-four hours before stuffing, when it will be found of uniform dampness and fairly ripe.

STUFFING.

The stuffing wheel is well known to most tanners who have been engaged in the leather manufacture for the past thirty years, and if my memory serves me right, it was first introduced into this country in an improved style, on or about the year 1860. But for

the benefit of those now coming upon the stage, I will give a more detailed description of the wheel, its construction and advantages over the old method of stuffing by hand. The accompanying cut will give a fair idea as to the manner in which it is set up, also the motive power and steam connections. The timber used in the construction is of two-inch pine, dressed and jointed, and six inches wide. The original diameter was only about six feet, but it was found that a wheel of eight feet in diameter, and from three and one-half to four feet in width, inside measure, worked to better ad-



STUFFING WHEEL.

vantage, giving a longer drop to the leather and thereby greatly facilitating the work. The inside circumference of the wheel is irregularly studded with oak or ash pins, of a sufficient number to pick up the sides, during the revolutions, and carry them to near the top center and then dropping them to the bottom, they are again picked up and carried upwards. The pins should be about eight inches long and of nearly two inches in diameter, and should be turned to a shoulder the same depth as thickness of staves. Let holes then be bored through the staves, and the pins driven in firmly to the shoulder ; otherwise the head and staves are jointed and put together similar to those of a tank or leach, that has flat or round iron hoops on each end to draw the staves together. Round

iron is preferable, and should be fully one-half inch in diameter. At each end a flange is made and turned outwards with right and left thread attachment, so that when the hoops are put on the two flanges will be from six to eight inches apart. A key or thread made of the same sized rod, having a square shoulder in the center of same and with right and left thread, similar to hoops, is then screwed in and the wrench applied to draw the staves firmly together. Heavy cast iron plates, having turned axles projecting six inches, and of three inches in diameter, are firmly bolted to each center of the heads. The one facing the operator is bored out sufficiently large through the axle to admit a three-fourths inch steam pipe for the purpose of introducing the steam into the wheel. This connection is packed with a swivel joint to prevent the escape of steam and also the disconnecting of the pipe, when the wheel is in motion. In the center of the wheel, and directly under the door, bore a hole two inches in diameter and insert a plug. This should be withdrawn every time the wheel is steamed up to pass off the condensed steam and what remaining particles of grease the previous pack failed to absorb. Run it into pans and when cool skim off the grease for future use. The door for putting in the leather should be fully two feet long and eighteen inches wide, and be made to secure a perfect fit in joints and securely fastened by thumb screws. At front and rear of wheel build a framework, some four feet apart and near the outer chimes, and connected to each is a timber of of the same size mortised and pinned together, whereon the box is set and bolted, and the axle is placed on it to support the wheel. By this means free access may be had to the door and plug, to put in the leather and also to run off the condensed steam.

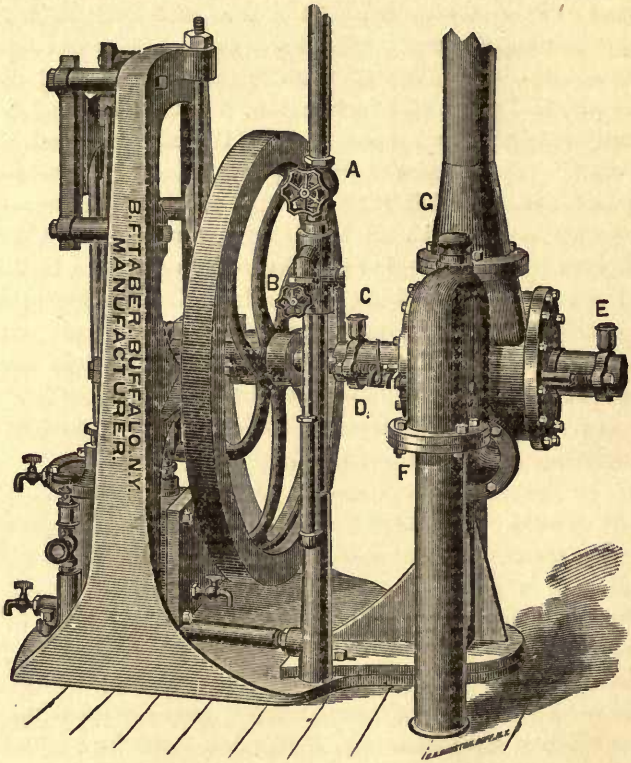
Many so-called improvements have been made in the mode of heating and feeding the leather with grease through a hopper as the wheel revolves, and by connecting coils of steam pipes within the wheel, which should be latticed over with wood so that the leather will not come in contact with the heated pipes. I would not knowingly discourage any needed improvements or inventions in the art of making leather, but experience confirms the belief that the safer and most practical way to stuff leather by wheel is that first introduced, and I believe most generally adopted, viz: First, by introducing direct steam into the wheel through the axle until the entire wood work is completely heated, or at about the same temperature as the grease which goes in later, that is, to 140 degrees F. A higher temperature is used—such as 150 degrees—but

where the leather is in good condition it is well to be on the safe side as the grease can be thoroughly absorbed at that temperature and without injury. Or a safe test of heat in the wheel may be had by the following process. After the steaming open the door uppermost, and allow the excess of steam to escape, then apply the hand to the pins, and when this can be done without burning, it is safe to put in the leather and grease, and set the wheel in motion as soon as possible. My experience with dry steam through coils of pipe has been far from satisfactory. I had them taken out and went back to first principles with gratifying results. The wheel thus heated with coils of pipe, is to be favorably compared to a baker's oven, but when the steam is carried a long distance from the boiler it frequently fails to raise temperature sufficient to properly force the grease into the leather. There should be a certain amount of moisture in the wheel, aside from that which is in the leather, instead of a dry furnace heat which has a tendency to destroy the life of the leather and render it hard and tender.

AMOUNT OF GREASE AND PREPARING.

Fill the steam jacket kettle with 75 per cent of English degras and 25 per cent of brown grease. This is intended for stuffing in winter or cold weather, but in summer increase the brown grease 5 to 10 per cent. Tallow and stearine are used by many tanners in place of brown grease, but both have failed to produce as satisfactory results. What is brown grease, may be asked? It is made from tanner's whitenings, table grease, and trimmings of finished leather, the gathering of stearine from the flesh of hand-stuffed harness leather. These ingredients are gathered promiscuously from tanners making all classes and styles of leather, by manufacturers making a specialty of this grease. It is dumped into large tanks containing water, having steam-coil connections at the bottom, and this water is thoroughly steamed up to a boiling heat. When the whitening and other scraps are reduced to a pulp, the grease rises to the surface, and is aided by a small amount of soda ash, which has a tendency to purify the grease and separate it from the water. It is then skimmed off and put into a jacket kettle, and steamed up again, to pass off in vapor any remaining water collected by the skimming process. It is then allowed to partially cool before being drawn off and put into barrels for use. When cold, it is as hard as the finest quality of stearine, and of a brownish or buff color, and is purer than tallow, as commonly rendered, and free from all foreign matter injurious to leather, such as

salt, acid, and alkalies, as the small amount of soda ash, used in separating and purifying, settles with the water and is there re-



LIQUOR PUMP.

tained and run off. Now we have what might be termed a combination of greases, each of which is beneficial to leather singly or united. By uniting on the above principle, any foreign matter that each may have had in its original state will be detected, and no tanner, however practical, unless aided by a competent chemist can discover the numerous impositions passed upon him when buying oils, tallow, degras, and all that enters into leather. We might go further and include brown grease, but the price is so low, compared with most all oils and greases, that it would not pay for the maker to use substitutes, except by the use of resin, but this agent can be readily detected, when the grease is melted, by its invariable bluish cast in color. To guard against this imaginary substitute, any tanner doing a moderate, or extensive, business can put in all the necessary apparatus for working over his tannery waste, at

slight expense, and feel assured of obtaining a pure article of grease. To go further, let us see what this combination is composed of. First, tallow, stearine, degras, sod, fish, paraffine, neats-foot oil, and brown grease, as the latter is rendered time and again, or the surplus which the leather failed to receive, and which improves in the rendering. Therefore I claim that brown grease, honestly rendered, is as pure as the best article of white stearine from lard or kidney tallow, on the market, and once within the pores and cells of the leather there is no dislodgment by evaporation, frying or gumming.

When the jacket kettle is once filled, steam is turned on and the grease is melted at a temperature of 140 degrees Fahrenheit. The steam is then shut off, to prepare the wheel for receiving the leather. The dimensions of the wheel, as we gave it, will carry 300 pounds of dampened leather, equivalent to 200 pounds of dry leather. For every 100 pounds of dry leather put within the wheel, after it has been heated and the condensed water drawn off, put in 65 pounds of the combined greases, or to the pack of 200 pounds, 130 pounds. Throw the leather in by folding it in book form, upon the pins at each side of the center, so that it may not come in contact with the hot grease there until the wheel is in motion. Close the door quickly, slip belt on to pulley, and apply the tightener to the belt which runs around the circumference of the wheel in the center, and run it for twenty-five minutes. At the expiration of that time throw off the belt, open the door, again set the wheel in motion, and run it for five or ten minutes to cool the sides. Take them out and throw them over the poles for a few moments to cool before taking them to the setters. The leather is then packed into boxes and covered with bagging. It is then supposed to be in proper condition for setting.

SETTING.

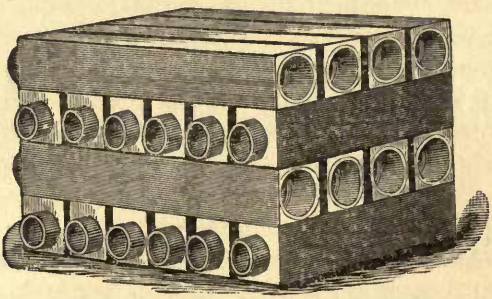
We now come to one of the most important branches of the work, that of giving character to the sides in back strip and flanks. The sides are first placed on the table, the back near the edge, flesh up, when the setter takes a steel slicker, fairly sharp, and commences setting out the side towards the butt and back, and having removed the baggy portions, passes on toward the hind shank and flanks, which are spread out naturally without pleating; he then turns toward the shoulder and fore shank and repeats the operation, keeping in view the alignment of the back strip. The side is then turned over and similarly worked on the grain side, but requires

more elbow-grease in stoning out the contracted grain, caused by the pin-blocking method it was subjected to in the stuffing wheel. After the grain is scientifically set out, the back straightened, and flanks full spread, the setter then takes the steel slicker of a stunter edge than used on the flesh, and goes over the entire side, removing marks of the former tool. The side at this stage should be made perfectly smooth and firm on the table, as though glued to it, and when it is taken off to hang up to dry, care should be exercised that the set is not destroyed. Hang them where they are not exposed to great heat or light, and let them dry slowly.

CHAPTER IV.

SLICKING AND BUFFING.

After drying, the leather is packed down in piles, with the grain up, full spread, covered over, and are allowed to ripen up for the buffing. They are then first slicked off on the flesh side with a moderately sharp steel slicker, and all adhering substances should be removed, otherwise in buffing, imperfections on grain will be made.



PLAIN SQUARE LIQUOR PIPES.

Buffing is a comparatively new feature in the finishing of oil grains, and it has been forced upon the tanners through imperfections on grain, caused principally by the cattle coming in contact with barb-wire fences. Some tanners buff the grain off only where imperfections are noticeable, while others buff the entire grain surface. The latter method I would recommend for the following reasons: First, the sides will take the black more uniformly, and retain it, where all the grain is snuffed off than where it is done in patches. Second, the leather will take the print uniformly, at the same time it imparts a fine, silky feeling to the grain, and manufacturers can warrant their products so made not to crack or fade by age. Objections to this method have been raised, on the ground that the

leather would be less water-proof by the removal of the cuticle. This objection, if it had any foundation in fact, has been practically overcome by the use of heavy greases. There is no class of leather now being made that is of a more water-proof nature than the popular lines of oil grains, and which are enjoying such an extensive sale. The Western tanners were the first to introduce this class of leather to the trade, and having practically perfected the tannage and finish, are now supplying the Eastern shoe manufacturers with mammoth blocks of it, while many of the Eastern tanners plod on in the same old ruts their fathers did before them in making wax upper, kips and calfskins.

BUFFING.

The term "snuffing" may be more properly applied to this work than buffing. By the latter term it will be understood that the outer grain is removed the same as in buff and glove leather. Snuffing implies only the splitting of the cuticle, leaving a firm foundation on which to pebble and throw up a prominent figure in graining with the cork board. This method simply removes the crusty, tiuny feeling of the grain, similar to the scales upon the fish species, and imparts a fine, silky feeling to the touch, and when finished will not crack or pipe up as when finished with the cuticle left on. This work is done by slicker similar to that used in whitening calf, kips, etc., on the flesh side. The edge is square across with slightly rounding edges, and steeled straight across the center and on each side, producing a keen, delicate cutting edge, severing the grain in strips of the thickness of fine tissue paper. Where barb-wire scratches are not too deeply imprinted, by taking a second cut they may be entirely removed. But this is the exception, not the rule, as many hides are so badly scratched, and to such a depth, that should the buffer undertake to buff them out he would have no grain on which to finish, but in place of it open, coarse channels throughout the side, which would quickly consign it to the No. 2, or third selection. Barb-wire scratches are the greatest annoyance and damage the tanner has to contend with. Branded, grubby, cut, scored, hair slips, and manure hides are sold on their merits, but however careful he may be in the selection of what are classed as No. 1 hides, he cannot discover the innumerable railway lines, stations and side tracks indelibly imprinted on the animal's hide until he gets the hair off, and for all this barb-wire engraving he can obtain no redress. It is like the boy's swapping jackknives, "unsight and unseen," or buying a balky horse, which,

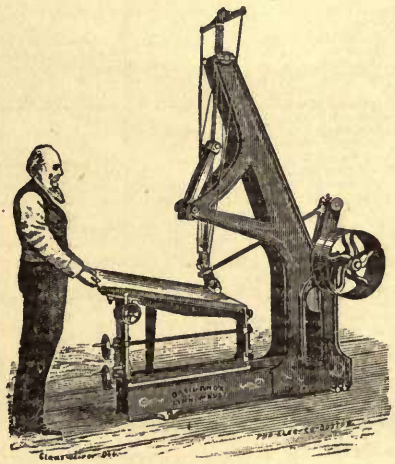
when he comes into your possession plants his fore and hind feet in the shape of a step-ladder and laughingly turns his head towards you and mentally asks, "What are you going to do about it?" Millions of dollars worth of hides are injured annually by the use of barb-wire fences. Still the work goes on, and the tanner alone is the sufferer. Is it not about time for the tanners to make an estimate of the average damage done to hides by barb-wire fences, and openly declare they will not buy hides except at such a reduction in prices as will practically warrant them in paying for "unsight and unseen" damage, while the stock raiser, farmer and butcher receives more per pound for the hide covering than they do for the beef which has been protected during maturity by the barb-wired hides? Suppose, for instance, that if the tanner indelibly engraved his business card with specialties on the body of every side of leather finished, would any sane person believe that he could sell it even at half price? It would be folly to attempt doing away with the barb-wire fences at a time when they inclose millions of acres of grazing land, but the chief remedy now is to seek redress through the only channel of escape—by regulating prices according to the value received.

I trust the reader will excuse this digression brought about in the endeavor to remove those unsightly blemishes on the leather, as it is too important a matter to pass by without giving vent to an expression which I feel every tanner engaged in making grain leather will heartily endorse.

BLACKING AND FINISHING.

After the sides are buffed they are taken to the blacking table, and are piled on in packs of twenty-five or more, with the grain up. Near the table is supposed to be the sig barrel, capable of containing about fifty gallons of logwood liquor. Directly over the barrel is a pulley connected with the floor timbers. A coarse gunny bag, which will contain one-half bushel of chipped logwood when filled, is securely tied around the neck with a cord, that is connected with the pulley in order that the contents may be raised from out the barrel at a sufficient height to drain and allow the blacker to apply the brush to the liquid after it has been thoroughly steamed up by the forcing of direct steam into the barrel, the condensing of which will supply ample water to the logwood and of the purest quality. When putting the logwood in the bag put in also soda ash of the size of a hen's egg, or only just sufficient to draw the strength from the wood. Fresh logwood should be replaced daily

in cases where a large number of sides are being blacked. Then lower the bag with the contents at intervals, to further extract the strength of the wood, and keep it at all times on an even temperature, or near boiling heat, as it is spread on the leather in small amounts and thoroughly rubbed in with a stiff brush, there is no fear of burning the leather, particularly when it is heavily stuffed with grease as in oil grains. To produce a deep black of durable color the sig, or logwood, must be well rubbed in. Its color at first application is of a purple shade, but when the grain is fully saturated it changes to brown. Care should also be given not to put on too much sig, but it must be well rubbed in until the grain is mellowed, and the surface grease cut sufficiently to readily absorb the black. This latter is applied in a cold state, and by the use of



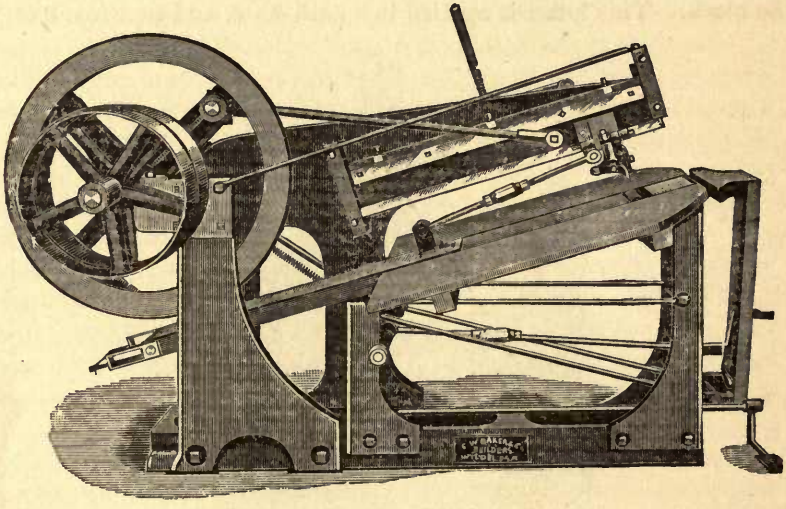
PEBBLING JACK.

a softer brush made from horse hair. It requires no great exertion to apply the blacking if the side is properly prepared with the logwood sig, as the grain takes the color instantaneously and requires only two or three immersions of the brush to go over the entire side. The sides are hung up for a few moments after being blacked, when they are taken down, folded flesh outwards in a pile—and are well covered to ripen up and be in good condition for the pebbling machine. The leather thus blacked should not remain too long in the pile before pebbling, as the more exposed portions will become too dry to receive a good impression of the pebbling roller.

PEBBLING.

There are several styles of machines in use for this work, each of

which will perform satisfactory work if the operator is familiar with machinery and construction. The bed should at times be leveled up, and new bolsters of solid belt leather be attached and evenly adjusted. Should the leather be greasy, and the roll fail to impart the necessary prominence in print, turn on a liberal supply of kerosene oil to the bed and allow the roller to pass over it a few times before putting on the side, and the roll will become perfectly cleared of all obstructions. A stiff bristle brush is frequently used with applications of kerosene oil to clear it. The operator should place a side on the table with the back outwards and then commence near the center and work towards the back to the butt; then, by a quick movement, he should jump the side to the commence-



STAKING AND PERCHING MACHINE.

ment and work towards the head, then turn to the fore shanks and finish up on the hind shank. He should be as careful not to lap over the roll as in leaving any line or space not touched, and to have sufficient pressure to imprint the side uniformly and deep, but not to cut the grain. Most every tanner has his peculiar style of pebbling roll in figure or character. But it is better that there be a uniformity as far as possible. In this respect the operator had better conform to the print of those used by tanners of large prominence, who have a reputation established in their goods. For instance, John Smith, a shoe manufacturer, has been buying his oil grain of Bill Jones, the tanner. The former may have established a reputation in the shoes by the character of the print. He is fre-

quently importuned to buy similar grades of oil grain from John Brown, a tanner who is striving to make a reputation, and in fact is making leather of excellent tannage and finish, but when John Smith looks over the leather of his anxious seller, he says: "Brown, I am sorry that I can't use your leather, the tannage is all right, but the figure won't match with what I have been using, and on which I have built up a reputation. But should you succeed in producing the same style of print I would be pleased to place orders with you occasionally, for I don't like to be confined to one house in the purchase of my stock."

This is an age of sharp competition, and he who wishes to be abreast with the times, will pattern after his more fortunate neighbor, particularly should he not be a practical tanner, or does not fully understand the wants of trade. I would not advise aping others, however, for there is a certain pride and independence in introducing styles and establishing your own reputation. Invent and perfect the styles, and when you know you have a good article, stick to it, and educate the trade up to that standard. In fact, be a leader, and not a follower.

GRAINING.

As soon as the sides are pebbled, set the grainers to work at soft boarding and graining. This is done by the use of a convex cork board, about fifteen inches long and seven inches wide, with slightly rounded edges. This is attached to the right arm by a leather strap, and then the hand firmly clutches a wooden pin six inches long, which is fastened to the center near the front end of the board. A portable cork table is then placed on top of the ordinary finishing table, and the "graining" commences, as follows: First he places the side flesh up on a cork table, butt to the front; then he takes the hind shank and boards diagonally to the head, and should the leather be of firm tannage, or "snappy" to the feeling, he goes over the second time from head to butt. This is what is termed soft boarding, and he not only breaks the crust and loosens the fibers, but distributes the several shades on the flesh side, which are caused by the free use of grease in stuffing, and by too quick or imperfect drying. The flesh is then many shades lighter, and shows the imprints similar to that on the grain side when cut by the cork board. Wet boarding is then done by turning the side grain up on the table. He cuts the figure at angles, first from the hind shank to the head, and thence from the tail to the fore shank. The strokes should be vigorous and the alignment of the two angles as

perfect as possible to produce a uniform figure. A more prominent figure can be thrown up by graining when the sides are in a damp condition, than when they are dry. When the manufacturer cuts his uppers and lasts them, the figure retains its former prominent character, providing the leather is firmly set after coming from the stuffing wheel. The contraction following after wet graining and drying will naturally leave the grain in a similar condition to that of embossed leather, and all after manipulations will fail to obliterate the figure thus produced.

DRESSING.

If a fairly bright finish be desired, of the most lasting character, and which will give to the leather a mellow feeling and indestructible finish, by the later applications of heavy oils, it will be produced by using the following recipe, which will also give a brilliant, coal-black lustre: Take eight ounces of extract of logwood, two ounces of prussiate of potash, one ounce of bichromate of potash, and eight quarts of soft water, condensed steam being preferable. Mix them in a pail and steam up until thoroughly dissolved. When cold, mix equal parts of the mixture and bullock's blood as wanted for use.

When ready to apply the dressing, place a batch of leather on the table and by the use of a horse hair brush, similar to those used for blacking, rub the dressing well into the pores of the grain. Go over the entire surface with a soft sponge, until the dressing is evenly distributed, and then hang up on the sticks to dry. The dresser should be frequently cautioned not to mar the flesh side with the dressing, when applying it to the grain, or when removing sides from the table to hang up, as those unsightly blotches show not only poor workmanship, but are unattractive to the eye of the proprietor, and the shoe manufacturer. Although neglecting to do so will not injure the leather, it is well to cater to fancy, when fancy pays the difference between neat and slouchy workmanship. We would then have two opposites, on the grain side a rich, deep black, and on the flesh, a spotless cream, or brownish shade, wherein gambier is used for retanning the sides after being split and shaved.

The leather should hang until fully dry. Then the sides should be taken down and piled on the oiling table for the final finish. Many tanners have made the fatal mistake, when endeavoring to give the required greasy feeling to the grain, of using light oils in the stuffing and oiling off. True, their leather is not lacking in oil,

on the contrary, it is almost swimming in it, and by the least pressure oil will freely exude from the pores; the flesh is unsightly and the fibres are so saturated that the leather has a ragged feeling. What the trade demands is leather of a water-proof nature, not saturated with oil, but filled with heavy greases that are not liable to evaporate, fry, or gum. This may be accomplished by using the combination, previously mentioned, in stuffing, which will practically fill the cells and pores. The leather, at the stage we have now arrived at, has a velvety feeling, full and fine in flanks, and withal no signs of oil on grain, when it has been submitted to a heavy pressure. But there is one important matter yet lacking. The grain, during the processes of blacking and dressing, becomes in a measure dry and harsh from the use of the several mineral and alkali ingredients, and it will be necessary, at this time, to give to its surface a dressing which will practically remain there while the lighter oil penetrates farther in and assists in producing the mellow feeling to the inner fiber and gelatine. For this work brown grease and paraffine oil, the latter of 25 gravity, may be used successfully, and at about one-third the cost of cod oil. Tallow, stearine, degras and other oils have been used for the combination, but all of those heavy greases have failed to produce as clean a finish and one that was free from a white scum, gum, or blotches on the grain, as when brown grease and paraffine oil are used. To every gallon of paraffine oil used in making this mixture, add one and one-half pounds of brown grease, or, for oiling pan containing eight gallons, put in twelve pounds of the grease, then set it on to the oil stove and heat it until the grease is fully melted and the whole assumes a temperature of 100 degrees Fahrenheit, for cool weather. Apply the well-filled swab to the thick butt and shoulder portions of the sides, being careful not to put an excess on the thin, flanky parts. Hang the sides up in a room of as near the same temperature as possible. For this work a hot room should be separated from the finishing room, as it will be found very beneficial during the cold winter months. In summer a greater percentage of brown grease may be used, and at lower temperature. The man having charge of this important branch will need to use his judgment as to the amount of grease the leather will carry, without leaving a too heavy coating on the surface, as much depends on the condition of the leather, temperature of the grease and room. The leather should remain on sticks until the grease is well absorbed, and then it should be packed on to wooden horses or tables, grain to grain

as far as practicable, and should any sides be found hungry, or not having the desired feeling on the surface, give them another light dressing of the same mixture.

ASSORTING AND CLASSIFICATIONS.

The leather, as received after the oiling off, is then measured, and the number of square feet per side, is ascertained, either by denoting the quarters, halves and square feet by a frame laid upon each side, or by the improved machines now very generally adopted, viz: The Sawyer self-adjusting leather measuring machine, or the Winter machine, both of which reduce to weight, the square feet or fractions, and are considered very accurate in measuring. The leather is then assorted and classified as follows: "A," "B" and "No. 2" in quality and in substance, the following usual selections are made: Light, medium, heavy medium and heavy. Each of these grades are then put up in bundles, containing one-half dozen. Commencing with butt of No. 1, at the right hand of the assorter, black up, and as far as can be matched, the next side black to black, and so on until the number is complete, the bottom and top sides being flesh outwards, the backs to the front. Then fold them from heads to butts in the center, and turn over the butt portions to the bend on the shoulder, make a half turn from shoulder to butts, and then complete the book by a lap from the opposite direction, and you have a neat package for shipment. The next bundle is reversed by placing the back portion to the flanks of the former. This gives a level package of one dozen sides, which, after being stamped with the number of square feet upon each half dozen, and also with the classification of the same, are tied together, and when sold are put into wrapping paper, and are then ready for shipment. Stock thus put up will continue to improve in the keeping, particularly when not exposed to the air and to changes of temperature.

Leather, when first finished, may be compared to fruit picked from the trees and put into barrels or cases for ripening. Like fruit, the leather grows mellow during the ripening process, the finish and figure becomes more uniform and pronounced, and when it is opened out for inspection the tanner then prides himself on being able to make so high a grade, but at the factory, during the process of finishing he could only see imperfections in finish and quality.

For dressing oil grain and imitation goat, a substitute for beef blood has been on the market and is pretty generally used among finishers making that class of work. It is called "Levant,"

and is put into barrels containing some fifty gallons each, and is made in several grades as intended for the different styles of finish. The cost per gallon for grade No. 3, which is used for this work, is 35 cents, in Philadelphia. But beef blood and the dressing for which I gave the recipe in this chapter, will not cost more than 20 cents per gallon, and can be made in a few moments when wanted for use. The dressing is far superior to Levant, and is perfectly harmless if compounded according to directions given. It imparts a rich deep black, will not crack or peel off, and gives to the grain surface a fine silky feeling. Where by use of Levant, the grain has a crusty feeling, and where the stock requires an extra amount of boarding it will give to it a greyish, streaked appearance. Many finishers have been forced to use Levant as a substitute for blood in its original state, on account of the difficulty and inconvenience of obtaining and keeping it for any length of time ; but where blood can be had at intervals, and kept in a cool place, tanners will find it far more economical, and desirable, in obtaining the object intended. The following recipe will be found a valuable blacking for either oil, shoe grain or boot grain blacking.

GRAIN BLACKING.

Take nine pounds of copperas, one-fourth pound of epsom salts, six ounces of ascetic acid and one ounce of nut galls. Mix and thoroughly dissolve the same by a steam pipe in a pail of water. Turn into a barrel prepared for the purpose, then add forty gallons of soft water, condensed steam preferred. It is then ready for immediate use and at the cost of one cent per gallon. This black I consider superior to cider vinegar black, made in connection with scrap iron turnings, etc., which costs some 30 cents per gallon and several weeks' time in making.

LIBRARY OF THE UNIVERSITY OF CALIFORNIA.

CHAPTER V.

FLESH SPLITS.—ASSORTING AND TRIMMING.

After the splits are taken off by the machine, they are then piled on the trimming table flesh up, backs to the front. The assorter and trimmer then examines each split carefully, selecting only those suitable for flesh finish. Those having cuts and scores, which are too deep to remove in shaving, are thrown aside, and if not to be finished on grain or split side, nothing should be trimmed from them; but they should be put into the drum wheel and run for twenty minutes with water or a medium run liquor of gambier or hemlock, and then taken to the yard, and then thrown into a good liquor. They ought also to be handled occasionally, and the liquor changed until the splits are well filled and weighty, and then they should be taken to the lofts, dried and put into bales for shipment.

From ordinary runs of hides there will be found only about 50 per cent suitable for flesh finish, and some 10 per cent of those will go in the "B" selection, or seconds when finished. Nothing below a "B" selection should be taken, as it is a waste of stock and money to finish the No. 2 splits. Neither should the very plump nor extreme light splits be put into this finish for shoe purposes. The grades mostly in demand are known to the trade as "A. L. M.," "A. P. L. M." "A. M." and "A. H. M." viz.: Light medium, plump light medium, medium and heavy medium. They range from eighteen to thirty-two pounds per dozen. The "A" denotes number one, the "B" the second selection, having the smallest cut or imperfection, and if too coarse are put into the latter grade. When selecting, all the thin portions should be taken off, and where a cut or hole is near the edge it is better to cut it out at this stage rather than waste labor, grease, etc., in the finishing, and then trim the hole out in the endeavor to put the split in the first grade.

SHAVING AND LEVELING.

Where the belt-knife machine is not at hand, first shave the splits on the flesh side, with the head knife, over a stake, being careful to remove all the remaining flesh from the skiving, and to split the blood veins so that they may be plainly discernible, but not too prominent, else when finished they will have to be classed as "B's." No better pattern can be given than that of the palm of the hand, and when the skin is shaved to conform with its outlines the resemblance to a finished calfskin is so perfect that the most practical will fail to discover the difference when made into shoes. A properly finished flesh split has equal, if not superior wearing qualities, to a calfskin, and it will cut up more economically.

When shaved, as suggested, splits are sent to the union machine and a slab taken off from the grain or split side. This slab should remove all uneven parts, and the split of a uniform substance from the shoulder to butt, and should conform as near as practical to the flank portions. The belt-knife machine will be found more advantageous in removing the flesh and splitting the veins on the thicker portions when the thinner parts can be snuffed over by the shaver. The skiffing taken off by the belt-knife has far greater value than where taken off by hand, being very strong and used for veneering purposes on pasted innersoling.

RETANNING.

Place within the drum wheel, say one hundred splits thus prepared, and put in with them three pails of good strong gambier liquor, similar to that recommended for retanning the sides. Add sufficient water to fully saturate the number and condition of the splits and run them in the wheel for thirty minutes. This pin-blocking method will prepare the splits to receive the hemlock liquors in the yard, where it will be necessary for them to remain some ten days, first in a second-run liquor of from eight to ten degrees, and finish them out in a first-run liquor of twelve degrees density. This work may be accomplished more quickly and with little labor by throwing the splits into the England handling wheel and allowing them to revolve only a few moments at a time, or just sufficiently to change the position of the splits and agitate the liquor. When the first liquor is fairly well exhausted, pull the plug out and let the liquor pass off into the junk, and then refill the pit with a good first-run liquor, and agitate frequently as before. Where color, weight and suppleness are desired it is well to give the pack another dose of gambier in the drum wheel after coming in from the tannery, then drain them and pack them in a pile for twenty-four hours before scouring.

SCOURING AND DRYING.

Scour on flesh side only, giving them a good, hard slicking with a liberal supply of clean water. Hang them in the lofts and dry them out thoroughly. After being dried weigh them up in batches, of say two hundred pounds each, for stuffing, and sammie as follows: Fill a barrel with clean water, then dip every alternate split in the barrel, and pile at full spread on the floor or table. Splits take water so readily in the condition named, that should every split be immersed, no matter how quickly, they would be found too wet and ragged to receive the grease. But by wetting one and

then placing a dry one of about the same size upon it, and so on, the dry split will absorb the excess of water from its mate, and after lying in a pile and being well covered with wet scoured leather for twenty-four hours they will be found in good condition for the stuffing wheel.

STUFFING.

For each batch of 200 pounds of dry splits thus prepared we will have, according to the usual test, 300 pounds of sammied splits. Fill the steam jacket kettle with grease in the following proportions: To every ninety pounds of brown grease add ten pounds of English degras. This is for cold weather stuffing. During the summer season nearly all brown grease may be used. Tallow and white stearine may be substituted for brown grease by tanners who are somewhat skeptical in the general introduction or in combining with other greases, but the writer does not have the least hesitation in recommending it, as he has experience through long use, and for reasons more fully explained in a previous chapter. No light oils of whatever nature should be used. Where heavy greases alone are used, there need be no fear of getting in too much. To produce a desirable flesh split, every portion of it should be completely filled with grease of such body to fill the cells, on the same principle that astringent bark liquors are used for filling and producing fine and fairly firm leather.

It is seldom, we find, that two different tannages of leather will carry the same amount of grease, consequently the stuffer will need to exercise his judgment as to the amount applied in the first batch. To be on the safe side, be sure and get in enough ; if the splits do not entirely absorb it, the excess, when setting can be slicked off and used over again without loss. The writer's rule has always been to use one pound of grease to every pound of dry scoured splits. Therefore we will put into the wheel, after it has been steamed up to a temperature of 140 degrees F., and the grease in kettle same temperature, the 200 pounds of dry splits, or 300 pounds of sammied, 200 pounds of grease, and run the wheel for thirty minutes. Throw off the belt and open the door, then start it again in motion, and run for a few moments to cool off. If it is then found that the splits have failed to absorb the grease, the operator should first satisfy himself, whether the condition of the leather or that of the tannage was the cause, and govern himself accordingly. The heavier the tannage, the greater amount of grease will the leather carry. The splits should be scattered around for a few

moments, and then be allowed to stiffen up before giving them to the setters.

SETTING AND DRYING.

Set them firmly to the table on each side, by the use of the steel slicker, but be careful not to have the edge of the tool too sharp, for by so doing, a good percentage of the grease within the cells, will be forced out, particularly should the splits be fairly warm, after coming from the wheel, where they have been submitted to such a high temperature as is necessary to force the grease in. The drying may be done by either hanging on sticks or nails. The better way is to stick two splits together, flesh to flesh, then cut a small incision in the top shoulder portions near the back strip, and hang them up on nails. This method will prevent a too rapid drying, and not only protect the flesh from dust and dirt, during the drying process in open lofts, but will produce a rich mellow surface when dry, and when pulled apart, the whitener will readily distinguish the difference by the cheesy, from the harsh cutting, where the splits are dried singly. Splits, like all stuffed leather, should dry slowly and without great exposure to heat, light or air. When so dried, pack them in piles and let them remain well covered for a few days before whitening. The whitening can be more scientifically performed by the use of the slicker, than by the head knife. They are first "roughed" off the entire surface, commencing from the center and working toward the butt, then reverse the split, and whiten the shoulder portion, taking off any remaining flesh. Should any of the veins be too prominent, cut them down, as recommended in a previous chapter on shaving. After the roughing off, a finer edge to the slicker is produced on the cleaning stone, and then the snuffing process is commenced by a right and left motion, from back to flank, severing the fibers and producing a smooth silky nap on which to finish.

FINISHING.

The first of the numerous manipulations to which the splits are subjected during the finishing, is the trimming off of ragged and thin portions, should any of the latter have escaped the attention of the trimmer, in the splitting and setting room. To give character to the splits, also, straighten the backs. Then place them singly on the cork table, with the grain or back uppermost, and soft-board them at an angle from the hind shank to the shoulder, and if they are too firm at this stage, board them again straight up and down. This adds greatly to the feeling and color of the back,

giving a uniform lemon shade, more particularly wherein gambier is used in connection with bark in the retanning. After soft-boarding, take them to the jack machine, the steel tool of which must be perfectly smooth and rounding at the edges, and then slick them on the back side. This will not only give a lustre to the backs, but will settle the fibers together, greatly aiding the glasser when glassing out the black. There should be no paste or sizing used on the backs before jacking, as that tends to harden the split and also to discolor the backs. The heavy grease within the split will furnish all the sizing necessary to produce a good lustre, and rich, mellow feeling. The splits are then in good condition for blacking and glassing on flesh side.

BLACKING, GUM AND PASTE.

Before proceeding to the blacking it will be well to make some blacking, paste and gum, which latter will be needed soon after. The former is considered superior when made ahead, as it will improve by age. I have used nearly all substitutes for soap blacking, but find nothing better than common laundry soap, in the proportions of one pound of soap and one pound of lampblack to every two gallons of water. First cut the soap in thin slices, add water, or bark liquor—the latter preferred—and steam them until the soap is fully dissolved. Then add the lampblack, by first breaking it up in the pound paper packages with a flat stick, holding the paper of lampblack in the left hand and flaying it with the other until reduced to a fine powder which is free of lumps. Then put the black into the liquid soap gradually, stirring it until all the blacking is in, and then reduce to the required consistency. Under no circumstances should the lampblack be steamed up or boiled with the soap. If this is done, your blacking will be soggy and lifeless. When made as directed the blacking should be, when cool, of the consistency of heavy molasses or bark extracts, and of a sparkling black.

FLOUR PASTE.

For every gallon of soft water used, take one quart of the best flour—patent flour preferred—and one-fourth pound of common hard soap, and one-half pound of cake tallow. Patent flour sifters, holding just one quart, will be found convenient for this work, for by dropping the sifter into the barrel and giving to it a rotary motion the flour is readily sifted and measured. Put the quantity of flour needed in a pail and mix it with soft water, being careful not to get in too much water until after the flour has been well kneaded

by hand or by a stick. Then reduce the batter by uniting with it the required amount of water. Cut the soap and also the tallow into thin pieces and put them into the flour. For cooking it a small jacket steam kettle is preferred, but if it is not at hand blow direct steam into the pail or keg, but allowance should be made during the cooking, say of twenty minutes, as during that time there will be nearly one quart of condensed steam added to it. Cook slowly, until the flour, soap and tallow are thoroughly united and the paste assumes the consistency of a thick jelly. During the cooking cover the keg with a head which has a hole bored in center for admitting the steam pipe, then cover the keg with a stout cloth.

GUM.

This being the last ingredient used in the finish, I will conclude the list before commencing on the blacking. Gum tragacanth is chiefly employed by curriers in securing a final finish to the leather after being glassed out of the paste. The best is the cheapest. To make a ten-gallon crock one pound of gum will be ample, add sufficient water at the outset, and stir it occasionally, for when commencing to dissolve it will pack in solid lumps. The older it is the better. It will ferment in the early stages, then it will commence to ripen up, and be in condition to use. It should be put in soak at least for two weeks before it is fit to use, and if allowed to remain two months so much the better. The mode of mixing with paste will be given as we proceed in the finishing.

BLACKING AND GLASSING.

The splits are now matched and piled on the blacking table, heads to butts, and flesh up, until some fifty to seventy-five are thus arranged. The blacking is then applied with an oval-shaped bristle brush, and should be put on in moderate quantities and well brushed in. Immediately after a duplicate brush, free of blacking, is used to rub over the surface, and should any particles of grease adhere to the split, remove them and cover the spots before giving them to the glasser.

Hang up for a few moments or until about five splits are blacked, before glassing, to temper them, so that the fiber and tanned gelatine may be firmly settled together. An expert blacker will not smear the back or grain side during the process, and he should be encouraged in this cleanly process, as a good clean back to a finished split is one of the attractive features of the buyer and a sign of good workmanship. The great trouble with many blackers is,

that they put on too much blacking, which has a tendency to open up the split and neutralize the grease, besides leaving it in a baggy condition. The glassing is then done on a table in close proximity, having a leather bolster pasted on or confined to the top of it. The glasser should also have at hand a brush, or sponge, saturated with blacking, and should any red spots show up in this glassing he could then go over them. The first strokes of the glass should be vigorous, and when the nap is well settled, go over lightly again, removing all marks of the tool, and then hang the splits up to dry. It is advisable to dry them fully before proceeding to the pasting.

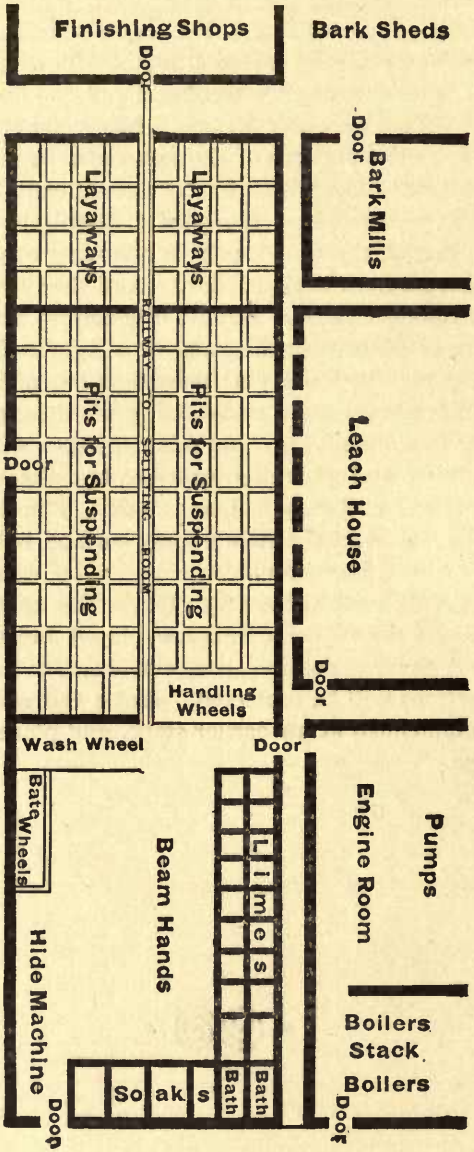
PASTING AND GLASSING.

Put one split at a time on the table. Take a clean, soft sponge, dip it into the paste and rub it well into the split. Pasting, the same as in blacking, requires but little material to go over the split, and unless it is well rubbed in will present a streaked appearance when dry, and not infrequently will crack and peel of. The proportions of tallow, used in the paste, will partially obviate this, and at the same time give to the surface a rich, greasy feel, which is so desirable. It will also prevent, in a measure, the objectionable bright finish and harsh feeling that follows the use of flour and soap. If the shop is warm, or the air clear, it will require but a few moments to dry or temper the splits, when they should be taken down and packed on a table, or horse, until a sufficient number is pasted and ready for oiling.

OILING, GLASSING AND GUMMING.

Unless the stuffer has failed to get the full quota of grease in the wheel, I should object strongly to the application of oils, at this stage, as it has a tendency to open up the splits after spending so much time and care in settling them together. But where insufficient grease is used in the first stages it will be found necessary to give them a dressing of warm oil on the black after they have been pasted. For this purpose use 70 per cent of cod oil, and 30 per cent of paraffine oil, mixed, and apply this mixture with a sheepskin swab, giving the butt portions the greater dose. Pack them in a pile on the table, black to black, there to remain until the oil is fully absorbed; then glass them, going over the pasted surface with moderately light strokes with the glass, or with strokes just enough to break the crust, and produce a slight polish on which to give the final dressing—gum. For this finish, take about 70 per cent of dissolved gum tragacanth, and 30 per cent of flour paste, as used in pasting. Mix and strain through coarse toweling, then

reduce it to the consistency of cream, and where possible to secure condensed steam, or rain water, use them in all kinds of pastes and dressings, also in making blackings for wax or grain leathers. The gumming, being the final finish, it is equally important that this process should be done by skillful hands. The sponge for this work should be soft as lamb's wool and not too open, and should also be trimmed on the outer surface. Never employ a lazy man or this work, as the motions of the arm must be rapid, and when the sponge is once filled with gum it should contain ample liquid to go over the entire split. He should distribute it evenly, and when once covered, the final touch in removing any excess should be straight across from back to flanks, and then the entire length of the back in one motion. Should a lusterless finish be desired, use a little more paste with the gum, or add a few drops of cod oil. This is a very popular finish with manufacturers making fine shoes. After the splits are gummed and dried, pack them on the table for the assorting and classifying. At this stage they will be submitted to the thumbing and pinching process, but the more they are handled the better will they feel and look. The imprints of the finger may be traced on the rich, cheesy surface, but there will be no marring or breaking through the finish by severe handling if finished according to the above directions. The splits are put up in packages of one dozen each, and are placed butts to butts, and black to black as far as possible, backs outward, so that in handling, the flank portions will be protected. Make the several classifications as recommended at an earlier stage, and place the initials on each package.



GROUND PLAN OF TANNERY.

CHAPTER VI.

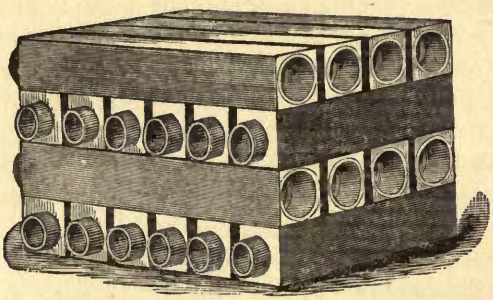
CONSTRUCTION OF TANNERIES.

To illustrate, and make comparisons from old-time methods, it will be necessary at this juncture, to construct an imaginary tannery. The writer is aware, however, that he will be trespassing on forbidden ground when undertaking to dictate the style of construction. What would apply to the city tanner would not equally well apply to the country, so far as relates to the material employed, but the interior arrangements need not materially differ. In the country or in the backwoods, where bark is cheap and lumber can be had for the sawing, the building can be constructed at comparatively little expense to what is required in Chicago or other large cities, for instance, where frame buildings are prohibited. The country tanner, when contemplating building, first looks to find a running stream of pure water ; in the city, along the banks of some river or on the lake shore. It is immaterial in these days of steam power, which has largely displaced water as a motive power for grinding the bark and milling the hides, whether a tannery be located on a stream or water-fall. It is quite essential, however, that direct communication may be had with brooks, lakes and rivers, for a bounteous supply of water for use in beam-house and tannery, as also to convey away the impurities, unless where conflicting with city or town ordinances, regarding public health laws. It is advisable to erect the tannery buildings at a sufficient distance from the streams and upon slightly elevated ground as a precaution against freshets and inundations.

The usual custom has been to excavate to the depth of the pits to be sunk, but the more practical tanner now constructs his tannery partially above ground. This is first broken and leveled, the foundation should be built on a level, or possibly some two feet below the surface, to conform to the immediate surroundings. The pits should be built and sunk before the building is erected. This work is the most important in the construction of a tannery, and particular attention should be given to preparing the foundation. The junk for receiving the partially spent liquors from the pits should be located where free access may be had at all times, and placed below the bottom level of the pits some eight to ten feet, and fully that size in diameter. This junk may be built of brick and cemented, or a wooden tank may be substituted, sunk, and thoroughly

puddled with finely kneaded clay at the bottom and entire circumference. No care or expense should be spared in this work when building. Thousands of dollars worth of liquors are run into this receptacle annually, and should a leak occur, it is not easily ascertained, nor is it convenient to make needed repairs after it has once been set in place.

When the junk is in position, the next thing in order will be to make connection with the liquor log conveyors, that run to each course of pits at the bottom, and each of which is connected to the header or cross log, running at an angle with the junk. The timber used may be of pine or poplar, as desired, and in all sizes. The logs should be turned longitudinally through the center, to prevent checking and dry-rot. These should be selected with great care, and should be free from cracks and seams, and the ends firmly clamped with iron bands. The logs are then driven to a shoulder to secure a perfect water-tight joint. The connections made, the



SQUARE LIQUOR PIPES.

logs should be laid in clay and well puddled, before the sections of the pits are set in position. Much depends on the foundations of pits, which should be as solid as when building an imposing structure. If the base is solid, and the strain equalized, there will be no setting thereafter, to be followed by opening of seams in pits and conveyors. In addition to the log conductors, hemlock timbers, six by eight inches, should be set every two feet apart, thereby securing a solid groundwork for the pits. The timbers ought also to be protected from decay, by free use of clay, well puddled, so that air or water will not penetrate. Clay will prevent leakage and protect the wood, if properly applied, but if put within the sections by careless workmen, and not well mixed and puddled, it is no better than so much tan-bark.

The question has been frequently asked: "What is the safest

and most economical style of pits?" There is the old-time "box" pit, and the frame pit, better known as the "Buffalo" pit, from the fact of its having been first adopted in that city. The writer has had experience with both methods, and has no hesitation in giving his unqualified approval for the latter, and for the following reasons: First, in economy of timber and space; second, it requires no clay between the pits, and should any leakage occur between the partitions, the liquor is not lost, as by the old method; third, where clay is used in the intersections, and the pit is not liquor-tight, the constant oozing out of clay (inside leakage) through the seam into the liquors, stains the leather and gives it an unsightly appearance. Therefore the preference is given for the "Buffalo" method, and for purposes of illustration this will be adopted.

"BUFFALO" PITS.

The foundation as prepared was for this style of pit, and having secured a solid bearing and acquired connections from conveyors to junks, the next operation will be to make a solid plank flooring, closely jointed. Hemlock planks, when not too shaky, are preferable to pine, and can be procured at much less price. The planks should be fully three inches thick, and laid irregularly, breaking joints, so that the bearing may be more uniform, and should then be spiked to the timbers, care being taken not to spike into the log conveyors. It is the custom with some builders to lay only this one planking; then make a calking joint with oakum. Others pay less attention to the first flooring, except to secure a firm foundation. After the staves are jointed and set up and keyed by a "wedge plank," a second flooring is sprung in; this is made of one-inch dressed pine boarding and jointed, and is then laid so as to break joints in the flooring below. This latter plan is safe and gives a strong support to the staves in the grooves cut into the hemlock planking, and after being calked in bottom and corner seams, the pit will be tight as a bottle. It should be mentioned that after the first planking is laid, an alignment is made at angles with the dimensions of the pits and outside the edge of conveyor leading to the junk. Grooves are then cut out, the thickness of the planks fully one inch deep, that the staves may be inserted endwise. This groove should be just over the outer edge of bottom conveyor, so that space may be had to bore through the flooring into the conveyor, which should be well in the corner of each pit. A perfect-fitting thimble is then driven through and into the con-

veyor, making a tight joint. The last stave that is set up on the sides and ends of each pit is wedge-shaped, and is "driven home" with a sledge hammer, after which the staves are securely nailed at the bottom and the second flooring put in as mentioned. The tops are then supported by planking of sufficient width, to afford a foot passage over the yard. These pits may be made double or single, as best suits the wishes or the class of stock the tanner is making.

By using this style of pits, the conductors leading from the leaches can be placed directly under the floor capping of the pits, and require no setting in clay, thereby being constantly exposed so that the attendant may readily discover any leakage. The pits should be filled with water, if bark liquor is not at hand, as soon as set up and calked; this will swell the joints and prevent their rising through force of surface water, and if spent tan-bark can be procured, it is a good plan to dump into each a cart-load, and let it remain therein until the pits are wanted for use, as it will tan the woodwork and save so much fresh bark later on.

The pits being in position, the outer sides and the ends must be protected from leakage and decay, therefore it will be necessary to construct a lining or chamber for the clay. This is done by using pointed scantlings, which should be driven about two feet below the bottom of the pits, and then lay strips of rough boarding horizontally on the inside of supports, one above the other as the finely mixed clay is run in and well puddled. It will be a good economy to pay a trusted man $5 per day, to walk around and see that this work is scientifically performed, than trust it to incompetent men or bosses, who look more to the quantity than quality of the work.

The writer has a case in point wherein a tanner built on too economic principles, which well illustrates the old adage, of "saving at the spig and opening wide the bunghole." He consulted an expert builder for building and setting the old-time "box" pits, together with conveyors to and from leaches and junk. The price given was reasonable for good, honest material and labor. The tanner then received the bid from a second party, a carpenter; his figures being one dollar less per pit, he secured the contract. The pits were made in the old-fashioned way, and were clayed in the intersections, as also in the foundation bed. The clay as used was barely moistened, and thrown in indiscriminately,—an attempt was made at puddling by the application of water and an inexperi-

enced man, at the end of a puddling stick. The tannery pits were completed to the apparent satisfaction of the owner and contractor. One hundred dollars, or thereabouts, were saved directly by the operation, but to the writer's knowledge, thousands were sacrificed through leakage in the pits and conveyors. A portion of the liquor also found its way into the junk, trickling along beside the bottom conveyors, and became cloudy from coming in contact with the clay, thereby greatly discoloring the leather.

This important branch of the work should not be trusted to inexperienced persons. The clay for this purpose should be as thoroughly ground, or kneaded, as that used for the manufacture of bricks or earthenware. For the intersections reduce it to the consistency of mortar, and then puddle it well, so that every pore, niche and defect in the woodwork may be filled, thereby preventing leakage and decay. Ten dollars extra outlay at this stage will save the tanner hundreds in the long run, and the knowledge of having tight pits will make his sleep more refreshing, especially at a time when margins are so close in the leather manufacture.

If contemplating having finishing shops above the tannery it is quite important that the foundation be solid and of stone, with brick walls from the basement up, but if the tannery is to be independent of the finishing shops, as it should be, then one story composed of wood with gravel roofing will be found to fully answer the purpose, and can be built at comparatively small cost. There will then be no necessity for laying a stone foundation. Piles, 10 to 12 inches in diameter, and 20 feet long, are set, or driven into the earth fully five feet, and about eight feet apart, to conform to the plans of the building. The alignment secured, a capping of hemlock timber is then mortised and set upon the piling and firmly secured with pins, and then roofed with a slight pitch towards the center, the whole supported by trestle work, thereby dispensing with the objectionable supports or uprights placed within the tannery, which not infrequently, when supporting a structure of three or more floors, warps the foundation of pits and conveyors. Numerous sky-lights should be placed on the roof, and so arranged that they may be opened and closed at the will of the workmen within. The same style of building may be made of stone or brick. When of piles, the boarding is placed on the outside, after having first secured a smooth facing and alignment of the piles, then shingled and clapboarded. On the inside, as a protection from cold and anchor frost, place sheathing paper from pile to pile, and pro-

tect the same by rough boarding extending to the roof capping. Many tanners, when building of wood, fill the intersections with tan-bark. This is a mistaken policy and very destructive to the tannery buildings. Tan-bark attracts moisture, and when wet and dry at intervals, dry-rot will soon be noticeable on timbers and sheathing, and repairs demanded. Tannery buildings of the above plan of construction can be built at very moderate expense, affording ample light and ventilation to the workmen, as also a durable structure.

INTERIOR ARRANGEMENTS.

The beam-house and tannery proper should be under one and the same roof, but with ample space between the lime and liquor pits to prevent the flow or spattering from one to the other, it being a well-known fact that lime and tannic acid are the greatest enemies the tanner has to contend with. The soaks and limes should be in a continuous line, or in sections, and directly in front of the beam-hands. These pits are built on the same principle as those in the tannery, but in place of a junk to receive the waste lime and water, it is conveyed through drains to the sewer or passed off directly into a brook or river.

MACHINERY.

The machinery on this floor may consist of wash-wheels, hide-fleshing or working machines, bate-wheels, handling-wheels, liquor pumps, lime-reels, a pate-splitting machine and grindstone. The main line of shafting from the engine room should be aligned with a view to connect with beam-house and tannery, so that connections can be made without too free use of counter-shafts or of running the belts a long distance. The handling-wheels in the tannery should be in close proximity to the bate and wash-wheels, so that the hides may be transferred from one to the other without unnecessary labor or expense. In sole leather tanneries the same rule will apply, as also for the acid baths, which should be next in line to the handling-wheel with a view to having no retrograde movements. The hides, when going from the beam-house, should continue their journey through the tannery without being forced to advance and retreat, as has often been noticed in tanneries where no system is adopted, and where one man's time and many hours in the process is lost in making connections.

LEACH HOUSE.

The building for protecting the leaches, wherein the bark is deposited after coming from the mills, should be entirely separate

from the tannery, but within a few feet of it, and connected by several apertures, enabling the liquor attendant to pass from one to the other readily when changing his liquors. This building can be constructed at little outlay, and on the same plan as the tannery, of piles and sheathed inside and out. The width must comply with the diameter of leaches desired, the height to be fully twelve feet, and the roof slightly pitching, graveled, and containing numerous sky-lights. The leaches should be set on a solid foundation. After excavating to a sufficient depth to guard against frost, fill in the space with broken stones to the level of the ground; then make a strong cement and unite the whole top surface, giving a slight pitch toward the yard, and on the inner edge place a box drain which should lead to the liquor junk. This cemented foundation will be a preventive against waste through leakage or bursting of leaches, as also of accumulation of surface water under the leaches, thereby preventing the woodwork from decay. When the foundation is secured, place in position heavy timbers 8x8 inches lengthwise, and from three to five feet apart, according to diameter of leaches. This basis applies to the setting of round or oval leaches. There is a difference of opinion as to which style of leach is the most durable and economical. The square-box leach, built on the same principle as the old-time box pit, is used in many tanneries. The first cost exceeds that of the round or oval leach, and unless thoroughly made and set with clay in the chambers it will cause a deal of trouble and waste by leakage. It is then found a difficult matter to repair the leaks; frequently they are built of brick and are cemented, but even then there is a possibility of further annoyance from tannic acid coming in contact with the lime and cement, each of which has a tendency to discolor the leather. The writer's experience, and that of many others who have used both kinds, have been in favor of the round leach for the following reasons: First, a saving of time and timber in the construction; second, they can be built outside the tannery and set in position at short notice and without the use of clay; third, should any leakage occur it may readily be discovered by the attendant, and easily stopped by tightening the hoops. It is advisable, when making the foundation for the leaches, to prepare for contingencies, in the matter of leakage particularly. Very frequently it has happened that first-run liquors are entirely lost by a defective stave used in the construction, or caused through dry-rot. The writer has had this experience, and in many cases it happened at night. This loss may

be greatly obviated when setting the foundation as recommended.

CONSTRUCTION OF LEACHES.

The material employed may be of hemlock, common or Norway pine; the former, where clear and from young trees, will make a durable leach. Norway pine is preferable to our common pine and need not be clear, only the knots must be sound. But when good hemlock can be secured, like that grown at the East, which is less shaky than the Western hemlock, it is used very extensively for building pits and all coarse work in tanneries and dwellings, and will outwear the best pine timber. The length of staves should not exceed seven feet—six feet is preferable for the easy pitching out of the spent bark—and six inches wide, sawed from two-inch planks, the bevel to conform to the diameter of the leach required. These are made to contain from two to ten cords of ground bark; no increased strength of staves or hoops will be necessary for the larger sizes, but an additional thickness of bottom planking, in all three inches. Then the bottom planking should be supported by a solid foundation composed of three 6x8 timbers, running crosswise the first timbers, as also the plank leach bottom, the front bottom support to be increased to 6x10 inches to conform to the pitch of cemented foundation. There must be no bearing whatever on the chimes; this oversight, when setting leaches, has in numerous instances caused great loss of liquor and inconvenience. When making the bevel to conform to the circle it is better that the sawed edges be left in the rough condition, rather than that they should be planed off smoothly for a finish, for when setting up and drawn together by the hoops a tighter joint can be secured.

Some opposition to the round leach has been given, for reason of its short life, compared to the box leach, which has been set and puddled with clay in the sections. Three to four years have been about the average time of service of the round leach, as usually set up. By being exposed to the changes of temperature in the tannery, and wet through overflow, the staves will soon show signs of dry-rot and become treacherous; to all appearance on the qe, to utside staves are sound, but by constant use and great pressure from bark and liquor within, will give away suddenly and unexpectedly, and not infrequently runs of liquor have been lost before a remedy could be applied.

The above has been the writer's, and I have no doubt other tanners have had similar experiences. He determined not to be again the victim of such waste under the circumstances, and commenced

to rebuild as fast as any of the leaches showed signs of dry-rot, and upon a more thorough method, both in the material and for the protection of them when put together. For timber, Norway pine was employed, as good sound hemlock could not be secured in the locality. After the staves were sawed and beveled, and before setting up, he procured some cold tar, porgee fish oil and red ochre; this oil is far preferable to, and less expensive than linseed oil, and withal of a gummy nature. The tar and oil were thoroughly cooked in a steam jacket-kettle, then the ochre was added to give color and body, and care was taken not to have the mixture of too great body as to crack or peel off when dry. For applying the mixture a wide painter's brush was used, putting it on hot to the joints of each stave when in the act of putting them together, as also to the bottom joints and outside bottom surface with a good coat, as access could not be had to those portions when the leach was set in place. The staves were then set up and the iron hoops placed thereon and the whole drawn together. Four hoops are required, consisting of three-fourths inch round iron, with flanged ends turned outwards, in which are drilled one-half inch holes, with right and left hand threads. The flanged ends should not come together, leaving some five inches space for taking up, and making allowance for shrinkage of the leach. A key, or iron coupling, six inches long with square shoulder in center, was then inserted and the wrench applied, when the several joints were made water-tight. Then a good coat of the hot mixture was applied to the outer surface and hoops, which, when hardened, formed a glossy coating, thereby preventing moisture from entering the staves from without. The tannic acid will preserve the inside wood work when filled at intervals. The expense of labor and materials did not exceed two dollars per leach. If any portion should become worn, it should at once be replenished, and the leaches will continue sound for ten years. With this experience, the round leach is recommended for more general use as a matter of economy and convenience.

A little paint and elbow labor will save much money in repairs, every year, in and around the tannery, at a few dollars' outlay. If any tool or machine is worth the purchasing, it is also worth preserving. The tannery buildings may be preserved and ornamented by a little outlay, and it requires no artistic painter to perform the work. Any common hand, with a little instruction in the mixing of material, will cover more surface per day than an

old painter would on coarse work. For outside painting, use the same materials as applied to the leaches, with the exception of tar, and where the real porgee fish oil is used, the paint will wear longer than that made from linseed oil and white lead.

When the leaches are in position, the false bottoms should be made to fit perfectly without strain, and rest upon bearings 3x4 inches, placed crosswise to the bottom joints; previous to securing the boarding, coarse hay or straw should be packed between the two bottoms, to allow the liquor to strain off before passing into the conveyors and pits. The false bottom is then irregularly perforated with one-eighth inch holes, to aid the percolation of the bark liquor when drawing off for use. Where the bark is ground too fine, a thick, muddy liquor will collect in the leaches and clog the outlets, and unless the above precaution is taken it goes into the pits, tending to discolor the leather and fill up the pores of the hides, thereby checking the ready penetration of the tannic acid. The purer the liquors, the clearer and more desirable will be the complexion of the stock, and less labor will be required to remove the bloom in scouring.

After the leaches are set and aligned, it will be necessary to make connections with the conveyors leading to the pits. These logs are placed within a few feet of the leaches, in a parallel line, or within the tannery, and connected by cross logs leading to, and directly under, the front edge of the leaches, and connected to them by a thimble driven through an opening three inches in diameter in the bottom, making a liquor-tight joint. These conveyors need attention in the setting, giving to them a firm and uniform foundation. Should the location require them to be placed in the ground, they must be well puddled with clay, the same as when placed below the pits. Where the press system is required, the connections from bottom to top, and from one leach to the other may be done at little expense. By this system purer liquors are obtained, and the density may be regulated according to the will of the attendant. In sole leather tanneries, wherein the liquors are doubled and trebled, and where it is not desirable to run them into the junk to mix with the weaker and impure, connections are made direct with the conveyors and liquor pump, and the first run is pumped over on a freshly ground leach; by this method liquors of thirty-five to forty degrees density are obtained for the packing and final finish in the "layaways."

In connection with the construction of leaches and press system, it is very important that ample pumping capacity may be had in the tannery. By this means little, if any, heat will be required in leaching the bark, for the reason that a greater number of runs may be obtained; in fact, the flow should be practically continual from leaches to pits, for in this manner the tannin can be extracted more readily from the bark, yielding purer and sweeter liquors than when applying steam and securing but one or more runs daily. For the final run clear water should be used, and steamed up to wash out that portion held in solution, and this product run over in a freshly ground leach.

BARK MILLS.

The bark mills, cutters, crushers, and liquor pumps, ought to be stationed where convenient, at the head of the leach system, and the conveyors, either by endless chain or by floating the bark by spent liquor, be built on a direct line with the leaches. The leach house is supposed to be on the back side of the tannery and within a few steps of the back section of liquor pits. The endless chain has this advantage over the floating system—that the spent bark can be conveyed to the boiler-room for fuel. The conveyor in this case leading from the bark mills should be located over, and resting on, the center of the leach system, having slide bottom traps through which to deposit the ground bark into the several leaches. The return conveyor is then placed on a line with the back staves without resting on them, where one continuous line of leaches are built, but when in pairs, the conveyors for each work should be placed in the center. The intersections between the leaches should also be covered by a tight board flooring, on a level with the top staves, so that the spent tan-bark may not collect or accumulate at the bottom foundation, as this oversight will surely aid in producing destructive dry-rot. The wood must be kept either continually wet or dry, to preserve it, and while it would be impracticable to keep the outside surface submerged, it will be found advantageous to allow no accumulations to gather around them, but instead, free play should be given for a draft of air at sides and bottom. If there is an excess of spent bark not needed for fuel, it can be pitched from the leaches through slide windows into the open space beyond.

ENGINE AND BOILER HOUSE.

The engine and boiler rooms should be within easy access to the beam-house, the bark mills and other tannery appliances, but they

should be built entirely of brick or stone, and separated from the other buildings. For generating steam, tubular boilers of large diameter in shell and tubes are more economical, although the first cost may be considerably higher than flue boilers ; they require but small space, comparatively, and the wet-tan ovens may be connected, without utilizing any more space than required for the tubular boilers alone. When the stack is of sufficient height, the wet-tan oven can be dispensed with ; this also incurs an additional item of expense at the outset, but in the long run it is a practical and profitable investment. Fan blowers may also be dispensed with when more attention is paid to building the smoke-stack. Make the flue of large capacity, and extend the stack to correspond with the diameter of flue and the surroundings. When putting in new boilers, engines, or machinery, it is better and more economical to double the capacity of that first required, than to tear down and increase your power a little later. There are but few tanners and others, but have made this error when first building. The expense of running a fifty-horse boiler and engine is not much above that of twenty-five or thirty, and where fuel can be had so cheaply, it should be given more consideration, particularly among tanners, when putting in machinery. It ought also be the aim to make the tannery comfortable and attractive to the workingmen engaged ; light, sunshine and good ventilation are the chief requisites in the workshops, but in the drying lofts, the two former must be practically dispensed with, and reliance placed in indirect ventilation to produce good merchantable leather that will please the eye, as also the sense of feeling, which will be dwelt upon more fully later on.

SPLITTING AND FINISHING SHOPS.

The building for this work should be at a reasonable distance from the tannery to lessen the risks by fire from one to the other, particularly where land can be had at a reasonable price. A miniature railway may be built from the tannery to skiving and splitting room at little expense, and the leather transferred by an open truck car to the elevator and taken to the lofts for sammieing. The advantages, in lessened cost of insurance, will largely repay the extra cost of transfer. A single story tannery, in case of a fire, would result in but little injury to the leather in the pits, but if it should be built three or more stories above the tannery, and those saturated with grease, the result may be imagined in case of fire, should the entire upper floors and roofing fall to the pits in a burning mass. The origin

of fires in many tanneries is through friction in the bark grinding machinery. Fire so generated is communicated to the accumulated bark dust, saturated with oil from the heavy bearings. For this reason I would urge the setting up of bark mills in a fire-proof room, which is well protected from fire by a liberal supply of rubber hose connected with the steam pump, which is constantly kept ready for immediate use. The finishing shops should be built with a view to strength and solidity, and as far as practicable to being fire-proof. Within this building most of the heavy machinery is placed, and the floor timbers need to be strong and well braced throughout. The first floor or basement should at all events be built of brick or stone, as the wet work in scouring, dampening and shaving is there performed, but when constructed of wood a dry-rot soon collects, and in a surprisingly short time the supports near the foundation walls require overhauling, and an entire new replacement of timbers and sheathing. On this floor the skiving, splitting, shaving, and scouring will be performed, as also the drum wheels for preparing the leather for splitting and for retanning it in sumac, gambier, or extracts. There will be required the belt knife and union splitting machines, scouring and knife-grinding machines, this latter to be enclosed in a tight partitioned room, so that the emery dust, when converted into flour in grinding the knives will not come in contact with it and discolor the leather.

The length of this building may be governed by the capacity of the tannery, but the width ought not to exceed 35 feet, and this width will equally well apply to large and small tanneries. Where the shop is too wide, the leather will not dry as readily in the sammieing, stuffing, or finishing, neither will there be as uniform light throughout. The workmen must necessarily have their tables, machines and stakes near the walls and windows, to obtain sufficient light, the more central portions should be reserved for racks for hanging the leather, particularly above the first floor in the finishing and stuffing rooms. When setting heavy machines, such as the belt-knife and scouring machine, a firm foundation should be first secured by excavating some two or three feet, and then stone or heavy timbers should be placed within, so that vibration or settling of the framework will not delay or cause imperfect work. The finishing shops, to meet the wants of the average tanner, should consist of four departments, viz.: The first, for wet work, as described; the second, for finishing exclusively, as also for the

several machines for the work; the third, for stuffing, setting whitening, buffing and trimming; also the stuffing wheels, steam jacket kettles, oil and grease; the fourth, or upper floor, for the sammieing of leather, for splitting and drying scoured leather and splits. This latter work can be done without extra expense in the handling, where steam elevators are employed, and which no tannery of any magnitude would be considered complete without. These labor-saving inventions, where more than one are required, are usually placed at each end of the building, but where only one is needed the center is more desirable for general work.

SOLE LEATHER.

For sole leather tanneries, two or three floors will be ample for drying and finishing. The first floor, or basement, to receive and oil the leather, when coming from the tannery; also the scrubber, for cleansing the leather; on this floor, too, the rolling machines should be placed, thereby securing a solid foundation, so important for this work; in close proximity to the rollers, the dampening tub and air-tight compartments, for packing in the leather, after dampening for the ripening process. Upon this floor, also, will be ample room for piling the leather, after being dried and rolled, as it is well known that sole leather will improve in quality on the ground floor or basement, where an even, cool temperature is maintained. The two upper floors to be devoted to offices and drying exclusively.

HEATING AND DRYING.

In no department is more attention demanded than to the drying of leather, particularly stuffed leather for finishing, also for sole leather, when preparing for rolling, and rough leather, when getting it in readiness for the market. In olden times, and one has not to go back many years, open lofts, or those with shutters and windows, were the rule; no precaution was taken against an excess of light and air, or protection from frost. The leather was frozen and thawed according to the temperature of the weather; artificial heat was seldom used, and the result, in dog days or wet weather, was mouldy and spotted leather; in winter, open, loose and spongy, according to the severity of the weather, as great loss in weight is caused by freezing and thawing. In those days it was a common expression among tanners that "one good freezing was equal to a layer of bark" to slack-tanned leather; this was true, as far as killing the hide and rendering the leather more pliable, and, at the

same time, imparting a light color, but when taking into consideration the loss in weight and quality, it was an expensive method, and now but few, if any, tanners follow that rule. Freezing is beneficial to some kinds of stock wherein weight and fineness of finish is not desirable, as in sheepskins, in linings and russets, and for collar leather. Sole leather is now dried in as many days as it formerly required weeks, and with great improvements in color and quality. Numerous appliances have been adopted by tanners to facilitate the drying, which has frequently been done at great expense. This is quite important with sole and rough leather tanners, because the condition of the leather, when going into the lofts, is so much different from that destined to be finished into wax upper and grain leathers. The long time required was a waste of money, and was no small sum to a large tanner, in the course of the year. Artificial heat is preferable to natural, as it can be regulated to suit the will of the tanner. Air is also an important agent; this can be obtained in an artificial way without the aid of steam power, and upon the same principle as a draught is created in the smoke-stack.

Lofts for drying should be so arranged as to admit of little light, and that indirectly. The windows should be shaded with blinds, or curtains, and closed for fresh leather drying. The steam pipes to consist of five or more courses, and arranged one above the other, supported by cast-iron hooks and attached to the inside walls, having a moderate pitch, sufficient to drain off when not in use. In the center of the lofts are to be ventilators, connecting with the ground floor, extending to and above the roof fifteen to twenty feet, according to location of tannery. Openings, with slide traps, to be inserted near the floor of the several lofts. For instance, a building 100 feet long would require five or six ventilators, 15x20 inches, outside measure. See that the openings in ventilators are made on a level with the floor, running perpendicularly fully twelve inches, and eight inches horizontally, with slide inserted to open and close at the will of the operator; there should also be slides the full dimensions of the ventilator running horizontally, on a level with the floor, to shut off communication with one or more floors if necessary. It is a mistaken idea to ventilate a room from the top, or ceiling, as the pure, hot air, being so much lighter, will readily pass off, while the damp, impure air will remain at the bottom. With the temperature of the lofts maintained at 65 to 70 degrees

Fahrenheit, the heat from the steam pipes will naturally radiate towards the center, where a constant and uniform circulation is created and maintained, by the escape of damp air through the conveyors. By this method the time can be lessened one-half over the ordinary way, thereby obviating the necessity of admitting a current of air from without, which is so objectionable to color and quality. Steam pipes are frequently placed directly under the hanging leather, and are secured to the floor. One might, with equal propriety, place a wet boot near a hot stove.

HIDE HOUSE.

It is highly important that the hide house be built independently of the tannery and finishing shops. It should be of stone or brick and of one story, with graveled roofing. Within this building there will be at times large numbers of hides, representing many thousands of dollars in value. It should be sufficiently roomy to store, assort and trim the hides for the several classifications intended. Space should be provided to put the hides, when not fully cured, into packs with salt until such time as they may be wanted for use. In the preceding pages on the erecting of tannery buildings the writer endeavored to so arrange the several departments that in case of fire there would not be that general destruction of property which would result in a tannery where the finishing shops, engine and boiler rooms were under one roof. The former high rates paid for insurance on tannery property where the buildings were so constructed were the means of causing decided changes in the construction with those who built at a later period and upon a more modern style. Now, with the more solid and fire-proof structures, and having all the appliances at hand for extinguishing fires, the rates of insurance have been reduced from four to two per cent and in some instances to even less rates. It would be found difficult for a small tanner of limited capital to indulge in these advantages, or we may say luxuries, in having a place for everything and everything in its place. But of late years the tanning industry has witnessed radical changes from old-time methods, both in the construction of tannery buildings and the concentration of capital. There are fewer tanners than formerly, but a majority of those engaged conduct their business upon a more gigantic scale and with ample capital at their command. Therefore when the building of a colossal and model tannery is contemplated it should be the aim to "not have too many eggs in one basket," yet not to cover so

much space as to incur needless expense in the transferring of stock and material from one department to the other, but, on the contrary, it should be built with a view to lessen the risks by fire and water. These precautions, though costing considerably more at the outset, will in the long run well repay the tanner, besides affording to him a degree of pride and greater security against loss of sleep and capital. Therefore I would urge tanners, when building, to have the hide house, tannery and other departments, wherein are to be stored the greater value in hides, leather, material and machinery, built apart.

Take, for instance, a tannery containing five hundred pits. That number, when filled, represents 50,000 sides of leather and a value of $150,000. Should the tannery be of only one story and the walls be built of stone or brick, the damage to the leather submerged in the pits in case of fire would be trifling compared to what would result should the finishing and stuffing lofts, comprising from five to six floors, fall upon the tannery pits in a burning mass.

BARK SHEDS.

The majority of tanners stack their bark in huge piles in the open air, roof and cover it as when shingling a house, to partially protect it from the inclemencies of the weather, and it is thus carried from one season to another. It is claimed that bark so piled and exposed will depreciate some thirty per cent during the first year. The writer is not prepared to vouch for this claim or even one-half of it, but will concede there must be a loss of tannin on the more exposed portions of the stacks through frequent exposure to rain and snow. On the other hand, where the bark is piled in sheds, allowing the necessary ventilation, it will improve by age, and personal experience has proven that bark so covered and protected and allowed to remain in pile from one to two years will produce liquors of greater density than new bark taken from the trees and properly seasoned. Bark should not be piled in large stacks when wet or before the sap is well absorbed through exposure to the sun and air. The facilities for receiving bark daily and weekly directly from the woods by rail and water are such that tanners have not, as a rule, laid in the usual number of cords during the peeling season to carry them through the year. But had they ample shed room it would be economy to secure the year's supply during and immediately after the peeling, for whatever is

carried over by the peelers for winter delivery will remain in the woods almost unprotected from the elements, being merely packed into rough piles some four feet high.

A durable and fire-proof style of shed for this work may be built of piles some forty feet long and similar to those used for telegraph poles. Sink the thicker ends into the ground to sufficient depth to secure a strong foundation and align them. Then nail upon the outside of the piles sheets of corrugated iron, lapping one upon the other about one inch. Continue this method until reaching the roof capping. The roof may be of the same material, and while not making air-tight joints, the sides and roof will be practically water-tight, and what is of greater importance, fire-proof from without. Where ample ground floor can be secured at moderate cost it is not advisable to construct the sheds of too great height, as it adds materially to the cost of piling the bark. When receiving the bark directly from vessels or by rail the entire front of the shed should be left open so that easy communication may be hap in unloading and piling. Sheds constructed on this plan can be built at comparatively small cost, and when painted to protect the iron from rust will make an imposing structure.

CHAPTER VII.

IMITATION GOAT AND BOOT GRAIN.

When imitation goat, made from cow hides, was first introduced to the trade it met with an extensive sale on account of the comparatively low prices as compared to the genuine goatskin. At that time finished goatskins sold at from thirty to forty cents per square foot, while the imitations from cow hides were made and sold at twenty cents per foot, and even at that price afforded an excellent profit to the makers. The writer, soon after the war, made several experiments in this direction by using cow hides and treating them in the same manner in the finishing processes as was applied to goatskins after being tanned in sumac. After several unsuccessful attempts he was enabled to produce a very desirable piece of leather. It was made in several substances from two to four ounces per foot, but of a dry finish, which naturally aided in producing a very bright one. It was also made into a luster less oil finish and a half bright to suit the wants of trade.

Tanners of calf and goatskins predicted a short life for this new style of shoe leather, but in this they were doomed to disappointment. The demand continued to grow as the manufacturers and consumers became convinced that the wearing quality was equal to that made from goatskins and at about one-half the cost. From that time to the present great improvements have been made, both in the tannage and finish, and now imitation goat and pebbled grain are among the most standard lines in the manufacture of fine shoes.

The class of hides most suited for this work are young heifers and cows. Plump steers will produce coarse flanks when submitted to the numerous manipulations of the cork board in graining or throwing up the figure produced by the pebbling machine.

The hides are prepared in the beam-house in about the same manner as those intended for oil shoe grains, of which full details were given in a previous chapter. The only change that I could recommend would be to lime and bate the hides a trifle more than for oil grains or imitation calf. This being practically a dry finish, no grease being employed, it will be necessary to remove a larger percentage of the gelatine to produce a tough and pliable grain which will not crack when finished. To overcome those objections and to secure the toughness of fiber characteristic of goatskins was the great difficulty which tanners had to contend with in the early history of imitation goat. To establish a reputation in the manufacture and to produce uniformity in quality and finish, the hides should not be tanned too hard in the endeavor to secure weight as when tanning for rough leather. Many curriers in the Eastern states purchase miscellaneous lots of rough leather to finish into imitation goat, and while an occasional lot may be of the desired tannage there will be found others totally unfitted for the work intended. This difference is largely due to low liming and insufficient working in the beam-house and in employing too strong liquors and too long time in the tanning.

The hides, when coming from the beam-house, are handled in the coloring wheel, and are suspended on sticks, similar to the method pursued with those intended for oil grains or imitation calf, and the regular routine of the work in the tannery need not differ from what has been given in the first chapter. The time may be lessened somewhat, in preparing them for splitting, providing the hides are not over plump, and they may be tanned sufficiently in

three weeks' time by making numerous changes of hides and liquors. Frequent agitation is required for this tannage, for, unlike the other styles treated upon, the grain is not buffed off in finishing, which has a tendency to produce a supple and satin feeling.

SKIVING AND SPLITTING.

The leather, after coming from the tannery, is hung up in the lofts and sammied in the usual manner, and is uniformly dampened and trimmed. It is then placed upon a table, or on a rounding beam, and all imperfections on the grain side are snuffed off by a miniature buffing slicker. The sides are run in the drum-wheel for twenty minutes and then skived, either by belt-knife machine or by hand, and are then assorted for the splitters. At this stage, should any of the grain scratches be too deep or prominent on the sides, they should be selected out and put into oil shoe grains, but if they are the desired pattern, put them into imitation calf, as these latter styles have the grain entirely buffed off when finishing. Consequently a larger percentage of No. 1 leather will be produced then than would have been if all the sides had been put into imitation goat. In those sides thrown out for imitation calf, punch one hole near the tail, and in those intended for oil shoe grain, punch two holes. Presuming that those intended for imitation goat are in the majority, these need not be marked. Such precautions will prevent mixing up during the subsequent manipulations. The several substances for this work, which will not materially differ from the imitation calf, range from two and one-half to four ounces per square foot, and frequently as high as five ounces, when used for boot legging.

The splitting may be done by either the belt-knife or union machine, and when splitting extremely light leather it is advisable to stone out the flanks and heads on the jack-machine. If the union machine is employed for this work, the knife should be ground daily, producing a thin, keen edge. When in the machine the edge should be "fiddled" up frequently, thereby preventing the tearing, or bursting, of the sides when passing through the machine. When the heads and flanks are well stoned out before splitting, it is important that those portions be taken down to a thinner substance than the body portion, for when pebbled and grained up with the cork board, the figure will be less prominent, and it will favorably compare with that produced on the fine and firmer body portion of the leather. The thinner the leather is

split, a smaller and finer figure will be produced in graining, and as the flanky portions are not used for vamps of shoes, but principally for toppings and button-fly pieces, those parts will, when thin and soft, have more value for that work than if they had been of greater substance.

SHAVING.

It is more important when making imitation goat that the entire surface of the side should be shaved over with the head-knife than it is for the other styles of finish, which we have treated upon. By so doing a nap is raised on the flesh, which not only makes the flesh more attractive, but in producing the nap the harsh, crusty feeling of the flesh is broken, imparting a supple feel to the sides. Again, should there be any uneven spots produced through careless workmanship in splitting and trimming, it would be found difficult at a later stage to produce as uniform and prominent a figure in pebbling and graining. Therefore, for this, work, I would advise shaving the entire split side, both lengthwise and crosswise. This work, properly done, will cost about 4 cents per side, or the same price that is paid for splitting.

RETANNING AND SCOURING.

It is well known that hemlock-tanned leather will not produce as lasting a black on the grain as oak or sumac tannage will do. It will grow rusty by age. Consequently for the double purpose of procuring a more attractive color to the flesh, and prepare the sides to secure a lasting black, we will employ sumac exclusively in the retanning. Curriers who make this class of leather from miscellaneous lots and tannages of rough material, will find the following method of decided advantage to them when endeavoring to produce something near a uniformity in color and tannage, and at comparatively little expense.

The drum-wheel, as has been previously described in the first chapter of the series, is constructed the same as the stuffing-wheel, but without steam-pipe connections. No tanner, making fine shoe leathers, can afford to be without one or more of these wheels, and they should be set up in the splitting and shaving room, and so adjusted as to make about twenty revolutions per minnte. Turn the wheel so that the door will be at the top of the center. Put within the wheel thirty sides of the shaved leather; then put in a common water-pailful of dry American sumac, and from three to four pailfuls of warm water, or what the leather and sumac will fairly

absorb, without dripping when taken from the wheel. Run the wheel for thirty minutes. At the expiration of that time the leather will have practically absorbed the tannic acid in the sumac, and the flesh will have changed from the brown shade of hemlock to a rich cream color, similar to that produced by tanning goatskins with sumac exclusively. As they are taken from the wheel, pack the sides into boxes in the rear of the scouring machine or table, and let them remain there for twenty-four hours before scouring. By this method there will be little, if any, waste of tannic acid, for by lying in pile, the time stated, the leather will have fully absorbed the tanning properties of the sumac, at the same time imparting to it a mellow and elastic feeling, and withal, a toughness of fiber that cannot be produced by the use of hemlock bark alone.

SCOURING AND SAMMIEING.

Take only a few sides at a time and immerse in a bath of clean, warm water and rinse thoroughly before placing them on the scouring table. Scour upon the grain side only, either by hand or machine. Give the grain a thorough stoning that will completely distribute the old grain and remove the bloom. Then wash off the grain with a liberal supply of warm water from the tub, and go over it again with a smooth steel slicker, expelling the water well from the pores. Then fold it in book form and pile it at the rear of the table.

To guard against "grain cracking" when the leather is finished it will be necessary at this stage of the work to give the sides a liberal supply of oil or all they will carry without its running to waste. Take seventy-five per cent of the best cod oil and twenty-five per cent of paraffine oil of twenty-five gravity and mix them. Place upon a table, with the grain up, a side of the scoured leather, and give it a good dressing of the mixture. Continue the process until the entire pack is oiled, piling flesh to grain. This will be found a great improvement over the old method of solely oiling on the grain side, and this only as they are taken from off the scouring table, as the flesh will aid in absorbing the excess of oil and also greatly improve the complexion of the flesh, as fish oils contain a fair percentage of acid, which acts as a bleaching agent to the leather when hanging up to dry. When the pack is thus oiled fold the sides in book form and put them into several piles to prevent too great a pressure that will force out the oil, and immediately take them to the lofts for sammieing. Suspend the sides from head

to tail on racks, and should the delicate color of the flesh be of future consideration do not admit too strong a light to the sides, but maintain a continuous current of air in an indirect way as suggested in the chapter on construction of tanneries. It will not be necessary to dry out the sides thoroughly unless with a view to carrying them in stock for a time before finishing. The temper of the leather should be the same as that intended for the wheel stuffing process—neither too wet nor too dry, but in the condition that the moisture, by a good pressure of the hands, may be forced from the pores and cells. This condition may be better accomplished after the leather is sammied, then uniformly dampened and allowed to remain in the pile, where it is well protected from the air for twenty-four hours before setting.

SETTING.

It has been the custom of many finishers to set out this leather on both flesh and grain, either by hand or machine. But when wishing to procure the required elasticity in this class of stock and withal to preserve the former mellow feeling and preserve it from free "grain cracking," I would advise setting, as in scouring, on the grain side only. If intended for a bright finish care must be taken that no grease of whatsoever nature comes in contact with the leather at this time. Pure oils may be used with safety in quantities that the leather will fairly absorb, but should tallow or other heavy greases be used, either as a "set" or upon the leather, it will be found impossible to produce a bright finish after it is pebbled and blooded. Care must also be taken that the jointed staves of the table are snugly drawn together and faced, otherwise when setting firmly on the table, and particularly on light grain leather, these imperfect seams will leave prominent lines across the sides, from which, when dry, it will be impossible to remove them when pebbling and graining, but which, on the contrary, will be thrown up more prominently. Before placing a side on the table take a clean sheepskin swab and give to the table a good dressing of oil of the same kinds and proportions as used at the scouring table. Then place the side on the table, grain up, and first remove the "bag" with a stone tool and carefully and thoroughly work out the old grain until the side assumes its natural contour in back strip and flanks. Then go over them again with a smooth slicker, being careful not to cause any abrasions on the grain and also to remove all tool marks in the stoning.

Give to the entire grain surface a good coat of the oil, particularly on the firm shoulder and butt portions, with an extra touch on the brisket. Then hang them up to dry as previously recommended for scoured leather. Dry slowly and in a dark room.

BLACKING.

The blacking for this style of finish need not be as strong as for oil grains, which are heavily stuffed with grease. The following recipe will make a very cheap, durable and clean blacking.

IMITATION GOAT BLACKING.

Take seven pounds of copperas, three pounds of gambier and one ounce of nutgalls. Dissolve in two gallons of hot, soft water and pour the mixture into a barrel capable of holding forty-five gallons. Add forty gallons of soft water, condensed steam preferred, and it is ready for immediate use, and at a cost not to exceed one cent per gallon.

In making all manner of blackings, dressings, paste and gum, I would urge the use of condensed steam, or drip-water from the exhaust, or steam-heating pipes, such as those used in and around the tannery. This water is much purer and softer than rain-water. When tanners fully realize the value of this water for the purposes mentioned they will, I feel confident, at once set a barrel beneath the drip-pipes, where they may at all times secure a liberal supply. When aiming to produce a soft, mellow feeling to the grain surface, hard mineral waters should not be employed.

The sig, or logwood, mordant for imitation goat, need not be as strong as used for oil or boot grain leather, as there will not be the grease on the surface to cut, to procure the desired black. Should an excess of logwood and sal-soda be used and applied in too large quantities, the leather would smut or crock on the flesh side when submitted to the numerous and severe manipulations in cork boarding. But where care is given to the compounding and putting on the sig and blacking, then a white handkerchief vigorously rubbed over the grain surface, after the leather is dry will not become soiled. Hang up the sides as they are blacked, and let them remain until they are entirely dry. The light color to the flesh which has been jealously guarded during the previous handling, should not, at this stage, be marred by careless workmanship when blacking, for when finished it will be difficult to discover traces of hemlock tannage. It is very generally conceded that hemlock tannage is superior to oak bark or sumac, in so far as producing fuller and

finer flanks, as hemlock has greater packing properties than oak, but when combined with oak or sumac the harsh nature is destroyed, and the leather will more readily adapt itself to subsequent handlings in the finishing shops, and in the factories when made into fine shoes. Although sold in the markets as imitation goat, it is, in the writer's judgment, of superior wearing quality to the real goatskin, besides being more flexible and yielding to the feet of consumers when finished according to the directions given.

TRIMMING AND DRESSING.

When the leather is dry trim off all ragged portions, and should holes appear near the flanks cut them out, for when dressing and polishing they will cause annoyance by smearing the flesh, and will tear when coming in contact with the polishing tools. It is equally important that the ragged edges be removed before pebbling as the pebbling-roll will become clogged with fibrous matter, thereby preventing the securing of a prominent figure. After being trimmed place a batch upon the table, black up, and go over the grain surface, noting carefully any imperfections, or those spots previously snuffed off in the endeavor to remove barb-wire scratches, and where they are too prominent apply scar paste with a small sponge and rub well into those spots, being careful not to cover more surface than necessary. The following is a recipe for making scar paste.

SCAR PASTE.

Take five ounces of granulated gelatine and dissolve in one quart of cold water, four ounces of extract of logwood, one-half ounce of bichromate of potassia, one-fourth ounce of carbonate of potassia, and one-eighth ounce of sulphate of copper. Dissolve logwood, potassia, etc., in two quarts of hot water, mix it with the gelatine, and stir until it is thoroughly united and commences to congeal. When cold it should be of the consistency of jelly.

When trimmed, again place a batch on the table, black up, and, with sponge dipped into warm, soft water, or condensed steam, dampen the grain until the leather is in the required temper to pebble, and to prominently retain the print when dry. Again place the sides upon the table and give to the grain surface a black and blood dressing. The blacking to mix with the blood, is made as follows :

IMITATION GOAT DRESSING.

Take eight ounces of extract of logwood, one ounce of bichromate of potassia, and two ounces of prussiate of potassia. Dis-

solve the ingredients in eight quarts of soft water and set the mixture aside to cool and settle.

To every gallon of the above dressing add three quarts of beef blood and mix thoroughly together. Take a soft horse-hair brush and rub the mixture well into the pores of the leather, and as soon as it is "struck" in take the sides to the pebbling machine.

PEBBLING.

The character of the print on the pebbling-roll should conform as nearly as possible to the natural figure on the grain of goat skins, as it must be remembered we are endeavoring to imitate the character of goatskins by the use of cowhides. First see that the machine spring-bed is properly adjusted, and that the pressure is fairly equalized, but without too great a pressure at top end of the bed. Place the side on the table, back to the front edge, and commence the first strokes on the butt and tail, taking about one-half the width of the side at each stroke; continue on to the head, being careful not to make any laps or omissions in the print, and when at the end of the head swing the side around slowly taking in the fore shanks, thence to the flanks and hind shank, and note results. The first dressing of the above mixture secures a good foundation on which to finish, as the heavy pressure applied to the roller will force the blood mixture to the pores and indentations, securing a good basis on which to throw up the grain when cork-boarding. As fast as the sides are pebbled they should be "wet-boarded," which is consummated as follows:

Place upon the finishing table a portable cork table, then place the side grain up, and with the cork-board, connected to the right arm of the "grainer," grain the side at two angles, commencing at the hind shank and continuing to the head, thence from the butt or tail to the fore shanks. These manipulations will throw up the print more prominently, and are termed "cutting the figure," for should this work be done before the sides were pebbled a larger figure would be noticeable, particularly on the loose portions, and we should fail to produce that uniformity of figure, so desirable. After being wet-boarded, pile them upon the finishing table and give the sides the second dressing of the blood mixture. If a very bright finish is desired use more blood in the second dressing, say equal parts of beef blood and blacking, and then hang them up to thoroughly dry. In all these manipulations the finishers should never lose sight of that word "Cleanliness." This simple word

which it is claimed, "is next to godliness," should be printed in large letters, and pasted upon the walls of the tannery and finishing shops. One great advantage the French tanners have over the American, is in the cleanliness of their stock, and the artistic manner in which they put it up for the market. Their skins are spotless on the backs, and as clean and attractive as a shirt from the laundry. It may seem ludicrous to insist upon tanners catering to fancy, when we take into consideration the dirty and disagreeable work in producing leather, but when fancy is willing to handsomely pay the cost, why not take the same pride in making wearing apparel for the feet as in making the clothes worn on the body? There is no better time than now to pattern after our foreign competitors in this respect, and when putting your several specialties on exhibition at the World's Fair, in 1892, you can take just pride in listening to and reading the encomiums of praise and awards made for merit, style, and fancy, if you please, in your products.

After the sides have received their second coat of dressing, and have dried out, board them on the grain again at two angles, as before, then soft-board them two ways on the flesh, commencing from the belly and going to the back, then run them down from head to tail, when they are in condition for polishing, and directly afterwards receive the several grainings on both sides.

POLISHING.

There are several machines for this work each of which will perform satisfactory work when managed by skillful hands. The tools are made of either lignum-vitæ wood, highly polished, or of glass; the former is preferable, for should any nicks be made in the tool they can be readily removed by the use of sand-paper. In this work the strokes should not be too long, but commence midway on the side from belly to back, and carry the side along at each successive motion, and turn the side the same as in pebbling to the flank portions. With the two coats of dressing given the sides there will be produced by the machine a highly lustrous finish, but the repeated strokes of the polishing tools will flatten the former prominent figure although the outlines are well defined. To restore the print to its former prominence the leather is again taken to the graining table and submitted to the following manipulations: Place the side grain up on the cork table and grain it at an angle from the butt to the fore shank. Then soft-board it on the flesh

from head to tail, giving it an opposite angle on the grain from the hind shank to the head, and finally cross it lightly on the grain from belly to back. Therefore we have grained each side, previous to and after polishing, ten times. Thirty sides per day for one man is considered a good day's work.

The final act will be to go over the sides with a medium coat of oil on the black, consisting of equal parts of cod and paraffine oil. This oiling is not so much to soften, as to bring up the black and give to the grain the desired silky feel. Wherein paraffine oil, of twenty-five gravity, is used in connection with fish oils, there will be no danger of the leather frying and gumming, even though carried in stock for a long time. This oil may be used exclusively in the final finish, and will produce a cleaner grain surface than fish oil. In the comparatively dry and porous condition of the leather, it will absorb the oil rapidly, and care must be given that too much be not put on, so as to show on the flesh side.

BRIGHT OIL GRAIN.

When wishing to make bright oil grain, or what is known as half-bright imitation goat, which, by the way, is a very sensible style of finish, such leather should be assorted from those previously pebbled and blooded and then practically freed from scratches and imperfections on the grain, for in a dull finish those imperfections show up more prominently than when polished by the machine. In place of being polished, the sides are given a good dressing of oil on the grain. For this work add about 8 per cent of degras to the cod and paraffine oil, as the former will greatly improve the surface feeling when grained up. The degras will also have a tendency to deaden the finish after having been blooded. The remaining work is similar to that performed on the bright finish after coming from the polishing machine, but no further oiling is necessary.

STRAIGHT GRAIN.

The leather for this style of grain is prepared the same as for the imitation goat, until it reaches the pebbling machine. The pebbling roll is cut straight across, hence straight grain instead of pebble. After the print is on, the sides are grained but one way, that is from head to tail, and the operator must be careful not to cross the print. The sides are then given another blood dressing and are dried out. Then they are soft-boarded two ways, from

belly to back, and from head to tail, and polished and oiled, the same as in the process for imitation goat.

BOOT GRAIN.

This leather is tanned in the same manner as are oil shoe grains, but the sides are split in substance ranging from seven to ten ounces per foot, the latter being used principally for fishing and brewer's boots. The retanning and stuffing is the same as treated for oil shoe grains. The grain is not snuffed off, except where imperfections appear, although since oil shoe grains have enjoyed such an extensive run, tanners are turning their attention to that method of buffing off the grain, and it is only a question of time when heavy boot grain leather will be finished the same way, with this exception, that a more prominent figure on the grain will be produced. If a dull finish be required the blood dressing can be dispensed with, but there seems to be a growing demand for a bright finish on oil grain leather, both for boots and shoes, and tanners should encourage this style of finish, even though it costs a trifle more, for the reason that a larger percentage of No. 1 leather can be obtained, when of a bright finish, than can be had from a lusterless finish. The same rule applies to imitation goat and all grain finish; but when finishing on the flesh side, as in wax upper, kips and calfskins, a bright finish will show up all imperfections, and give a coarser appearance to the leather. In olden times a bright, or "cat's-eye" finish, was quite popular on wax upper leather, while now it is the aim of tanners to procure a lusterless and greasy finish, which after all, is the most sensible.

"English" boot grain is finished nearly the same way as American grain, and with a very bright finish. The print is somewhat larger and round or oval shaped. It is finished in sides and crops, and largely used for custom work. Unless orders were given to to the contrary, I would advise tanners making either the American or English boot grain, to snuff off the grain the same as for oil shoe grains, thereby securing a more perfect grain surface and greatly improving the feeling of the leather when finished. The writer has had this experience when receiving orders for custom work, and snuffed off the entire grain surface, and in every instance the buyers were highly pleased with the leather and duplicated their orders, but had they been informed that the grain was removed, they would, undoubtedly, have returned the leather, not having been educated up to that point, or were in fact, opposed to innova-

tions on old time methods. Boot or shoe leather will give better service and be more comfortable to the feet wherein the grain or tinny cuticle is removed, than when left on as nature formed it. Nature formed the innumerable little nerves in the skins of animals, but to produce supple leather those nerves must be broken and removed in the beam-house.

CHAPTER VIII.

WELT LEATHER.

This is made from oak and hemlock tanned leather, principally from oak, and for hand and machine sewed work in the manufacture of fine shoes. For this work the leather must be fairly firm and plump, but of a mild tannage, consequently oak leather is more extensively employed. This class of stock is chiefly selected from rough leather, as but a small percentage of the average run of hides would make leather suitable for it. The grain should be practically free from barb-wire, horn scratches and scores and cuts on the flesh. The weight of the sides in the rough state may range from ten to eighteen pounds, but care should be given that the shoulders are plump and the skirtings full, similar to plump steer hides. When preparing the leather for skiving and splitting, trim off the head portion entirely, then commence on the throat, going to or near the fore shanks, then straight toward the hind shank including that in the skirting. For sides that are more spready than others, a deeper cut should be made, so that when skirted, the belly and back will fairly correspond in thickness.

Nothing should be left on the side, at this stage, that will have to be removed at a later period, as it would not only be a waste of money, but would show a lack of good judgment. The loose, thin, and unsightly portions are well outlined when the leather is in the rough condition, and should any doubts occur, it is better to give that part intended for welt the benefit of the doubt, for that portion which would have to be taken off later to insure its sale would have little, if any, commercial value. The heads thus trimmed off are sold separately on their merits, and the skirtings by themselves, the latter bringing about one-third the original cost of the leather. The sides, or "backs," as they are now more properly designated, are then dipped into a tub of water to dampen

and get them in suitable condition for skiving. They should lay in pile over night to mellow. When skiving, take off only the rough flesh so that when splitting it will not roll up on the knife, as the splits will be unsuited for flesh finishing, and when sold in the rough all the weight possible should be given to them. The writer, though not anyways prejudiced against oak bark tannage, has failed to ever produce a desirable flesh, or even grain finish, from splits so tanned.

When skived, the selections are made for the hand and machine-sewed welt. For the former select only such as are extremely plump, or of a uniform thickness in butt, shoulders and belly portions. Hand-sewed welts are of greater thickness than for machine-sewed, and the strips are cut crosswise of the side, while the machine-sewed welts are cut into strips lengthwise of the side, therefore it is desirable that those selected for the machine-sewed be, as far as possible, of perfect grain and flesh, unless the finisher cuts up the leather into the required widths, cements the strips together, and puts them up in rolls similar to those made by belt manufacturers. This method is now being largely pursued, and the backs are sold by the yard, in place of being disposed of by the square foot or pound. Then any imperfections in grain or flesh can be cut out and only prime stock be put into the rolls as offered for sale.

Those backs selected for hand welt should be punched near the tail, so that the two grades may be worked together until arriving at the buffing table, where only those for machine-sewed are submitted to the buffing operation, and they can then be readily distinguished by the punch mark. When splitting those for hand welts, there should be only sufficient split taken off to remove the uneven lumps on the kidney and head, and to secure a uniform substance throughout, which substance would be equal to ten ounces to the square foot finished into boot grain. In the machine-sewed there should be three grades, light, medium, and heavy medium, according to the pattern of the leather and that which will produce uniformity of substance, ranging from five to eight ounces per foot, dry finish. Those for machine-sewed are carefully shaved over the entire flesh surface, while those for hand-sewed are what is termed belly shaved.

RE-TANNING AND SCOURING.

For twenty sides, when split and shaved, put with them in the drum-wheel two pails of strong gambier liquor and what water is

necessary to thoroughly saturate the leather. Run the wheel for thirty minutes. Pile down and let them remain over night before scouring. The scouring is best done by machine, and this work should be thorough and all old grain and bloom be removed. Apply clean water at intervals to wash off the bloom, which is more noticeable in oak than hemlock tannage. Apply a light dressing of cod and paraffine oil to the grain, before taking from the table, and hang up in the lofts to sammie. The backs are then taken down, dampened and put in proper condition for setting and stuffing. The setting is first done on the grain, and no pains should be spared in this operation. Then turn them over with the flesh side upwards and slick them out firmly with a steel slicker. Then give to the flesh a fairly good dressing of dubbing, composed of equal parts of cake tallow and cod oil. Hang them up lengthwise to dry and let them dry slowly in a dark room.

When dry the flesh will have the appearance of having been whitewashed, and the grain will not show any signs of oil and will be nearly white. If too much grease is used the grain and flesh will be disfigured and the complexion will be unsuited for welt leather, as it will be subjected to the burnishing process, the same as sole leather when made into shoes. Those for hand welt are, when dry, selected from the machine-sewed and placed upon a clean table and the flesh lightly scraped with a steel slicker. The grain is then given a glassing to produce a finish. Those for machine-sewed are similarly slicked on the flesh, and are taken to the buffing table. Before buffing, take one-half pound of white laundry soap and dissolve it in a pail of hot water. Then with a sponge go over the grain until it is fairly mellow, when the buffing slicker is applied and the entire grain removed. It is first "roughed," then, with a finer edge, a snuffing is given which raises a white nap, giving a satin feeling to the surface. The backs, after a few moments' airing, are then assorted into their respective grades, and are put into rolls of half dozen each, the bottom side grain up and the balance of roll flesh up so that when rolling, the grain will not "pipe up."

GLOVE GRAIN VS. IMITATION CALF.

CHAPTER IX.

GLOVE GRAIN VS. IMITATION CALF.

Glove grain, for shoe purposes, was first introduced to the trade about seven years ago, and enjoyed a very good demand. It was finished with the grain on, that is, without buffing, but within the past few years makers of that class of stock have made decided improvement both in the tannage and finish. Now there are several brands on the market, all of which have a steady and increasing demand from manufacturers making fine shoes. It is now known as glove grain and imitation calf, the grain is buffed off and this buffing produces a mellow satin feeling when finished. It has, and will undoubtedly continue to greatly displace the use of wax calfskins in the manufacture of fine shoes. By the latter style of finishing, the leather receives an indelible black and can be safely warranted not to crack. It has advantages over wax calfskins, even though the same prices were paid for the raw material. First, by making it from small heifer and steer hides, or from medium-weight kips—this latter is a more desired pattern of leather for the cutting of boot and shoe vamps, and when tanned, according to the following directions, the leather will cut up more economically in flanks and shoulders than will calfskins of similar substance. Second: The leather thus tanned and finished will be equally as water-proof as a wax calfskin, and has equal, if not superior wearing qualities. By snuffing off or splitting the cuticle the leather is at once rendered supple and mellow, and will not become crusty or harsh in wearing as in cases where the entire grain is left on. In fact, it has the service of the best brands of French calfskins, but far superior cutting qualities in the flanks and shoulders, and when made up into a boot or shoe the average critic would fail to distinguish it from calfskins.

As in the preceding volume on "The Manufacture of Oil Shoe Grains," the materials and daily routine of the work in the beam-house and tannery will not materially differ from what has already

been published, but it will call for a different class of hides. Therefore with a view to make this style of leather complete, in itself, the writer will select a pack from the class of hides most suitable, and carry them along through the several departments to the stuffing and finishing rooms, wherein the work will be of an entirely different nature.

In the first place, unless the tanner can buy his hides of the desired pattern for the work, it would be advisable for him to also engage in the manufacture of oil shoe grains, imitation goat, wax upper or collar leather. For he will find when he gets his leather tanned and ready for splitting, there will be a number of sides unfitted for glove or imitation calf in pattern, neither will the grain be clear enough or free from barb-wire scratches. Those may be put into a lower grade of oil shoe grains or finished into kip upper on the flesh side, thereby securing a greater percentage of No. 1 leather than could be had in grain finish.

Medium weight from veal kips are largely employed for this work, and when these are not of too spready a nature, will cut, when finished, to better advantage than side leather.

Again, this class of raw material is not so liable to be injured on the grain side as are hides from young steers and heifers by coming in contact with barb-wire fences, and can be bought at about the same price that is paid for buff and extreme light hides. The heavy, plump selections are more desirable for wax finish where sold by weight, especially for the making of kip boots. Neither runners, or what are known as murrains and long-haired winter kips, are suitable for this work. The writer would advise tanners to purchase a medium weight run of green cured hides, consisting of young heifers and steers, for in the extreme light selections there will be found quite a number of young bulls which are totally unfitted for upper leather finish, and are found principally in weights ranging from twenty-five to thirty pounds. Hides running from thirty to forty-five pounds make a very desirable pattern for the work in question, but as it is somewhat difficult to procure those selections, except at a higher range in prices, it is better that the tanner should combine other styles of leather and purchase hides ranging from twenty-five to sixty pounds, and when tanned, those not desirable for glove, can be put into oil grains, imitation goat, wax upper or collar leather.

To secure the desired full flanks in hides or kips they should be

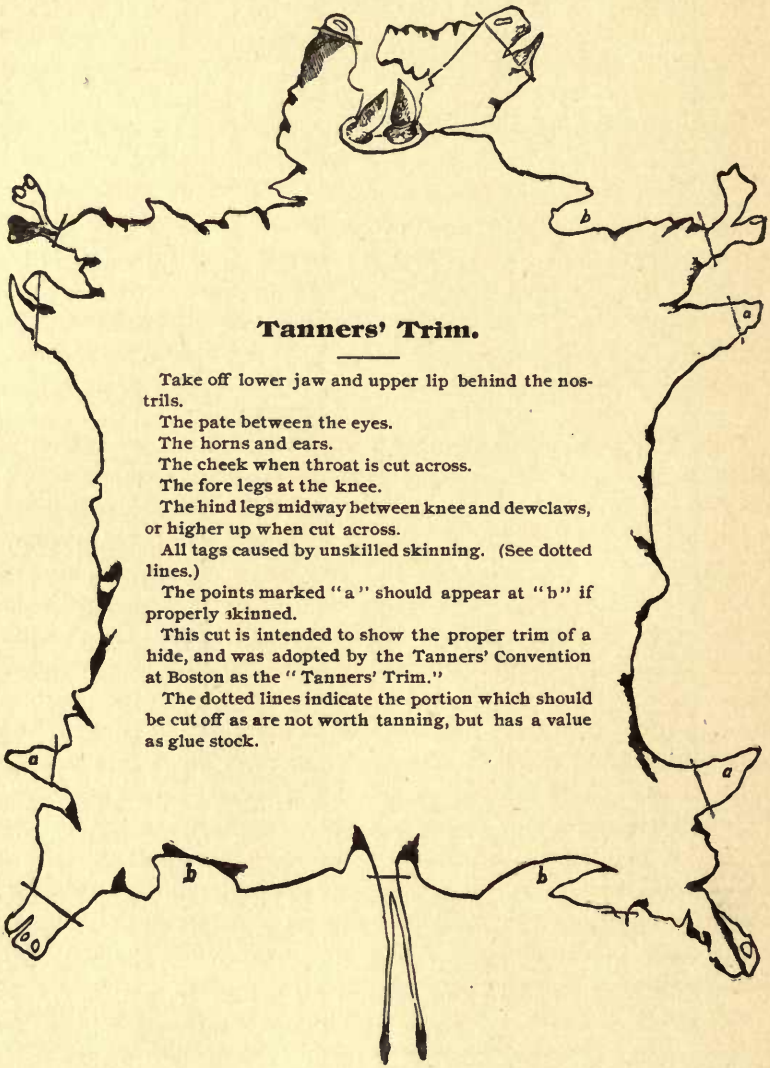
suspended on sticks in the liquor pits, and as extreme light hides, and medium weight veal kips, require about the same room in the pits as do hides of greater weight and dimensions, and nearly the same cost in labor, it is not good economy for a tanner to work extreme light hides exclusively, except he makes a specialty of calf and kips. I will, therefore, by way of illustration, carry along a pack of hides of weights ranging from twenty-five to sixty pounds, and when we reach the splitting room will make the several assortments.

HIDE TRIM.

The following diagram of "Tanners' Trim" was adopted by tanners assembled in Boston, October, 1886, at a time when hide values were from 3 to 4 cents per pound higher than at the present time. This style of trim was for sole, harness, and upper leather hides. But at current prices of hides I would advise, as a matter of economy, to make a closer trim than dotted marks denote in the diagram, and where the pates, or head portions, are so unshapely, they are practically worthless, and should be cut off entirely when tanning for fine shoe grains.

Glue stock has also greatly depreciated in value, and it is better to cut it off and throw it away, than to tan it and then, when the leather is ready for splitting, to remove it, and thereby lose by having to sell it at a nominal price. Tanners are looking about them to learn wherein they can make a saving in the manufacture, to successfully compete for a share of the trade, at the present low prices obtained for leather. There is no better time to commence using the pruning knife than in the hide house, and there cut off everything that will not make desirable leather and throw it into the glue pile. This branch of the work should be done by butchers and packers, when the hides are taken off, or after coming out of the packs, when cured. But as tanners have failed to demand their hides on that basis, there seems to be no other way than for each, or all, to adopt such method of trim as would be commensurate with the class of stock they are making. The tanner who has the courage to adopt a close trim on his hides, will find himself the gainer in the long run, and thereby secure for himself a reputation on his stock. What is there more unsightly than a side of leather, be it sole or upper stock, with long shanks, pates, dewclaws and tail, each of which appendages are practically worthless?

The close trim adopted by the most prominent calfskin tanners,



Tanners' Trim.

Take off lower jaw and upper lip behind the nostrils.

The pate between the eyes.

The horns and ears.

The cheek when throat is cut across.

The fore legs at the knee.

The hind legs midway between knee and dewclaws, or higher up when cut across.

All tags caused by unskilled skinning. (See dotted lines.)

The points marked "a" should appear at "b" if properly skinned.

This cut is intended to show the proper trim of a hide, and was adopted by the Tanners' Convention at Boston as the "Tanners' Trim."

The dotted lines indicate the portion which should be cut off as are not worth tanning, but has a value as glue stock.

was a move in the right direction, and was not only appreciated by shoe manufacturers, but was the means of establishing the reputation of those tanners, and of securing a higher price for their products. Still there are those, who might be classed as old fossils in the trade, who, at this late day, believe in tanning and finishing hides and skins "As nature formed them."

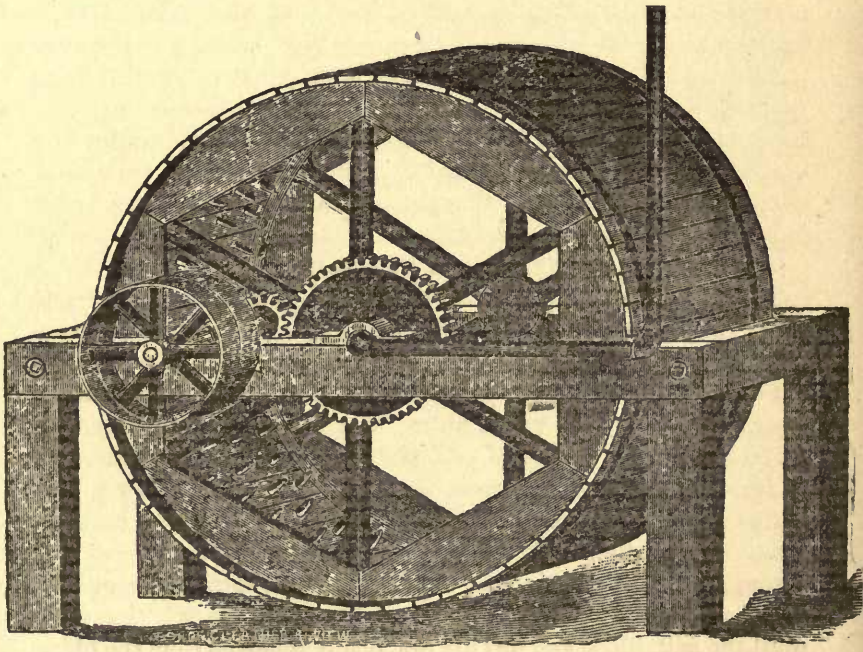
Nature formed the crab-apple, the astringent and distasteful cherry, but man, aided by science, perfected the fruit. Nature formed the forests, hills and valleys, but man cleared the forests, leveled the hills, filled in the valleys, and, where there were once stumps, rocks and underbrush, he caused vegetation to grow. Some one has to be the leader in all great enterprises, and the tanner who has the courage to strike out from old beaten paths, and adopt the close trim, even though he be unaided and alone in his purpose, will be sure to succeed.

PREPARING THE HIDES.

Take fifty hides—this number being the basis for a pack—and select them as near the average weight as possible; trim as recommended and take them to the wash-wheel in the beam-house. See cut of wheel. Where the wheel is of sufficient capacity, throw in from fifteen to twenty whole hides. Set the wheel in motion, and let on a bountiful supply of cold water. This, it is presumed, will be furnished by pumping from the lake, river or well, into a tank placed at sufficient height above the wheel to give the required force. Connecting with the tank, there should be a pipe running through the turned axle, and the flow of water should be regulated by a valve within reach of the operator. Let the wheel revolve until the salt, blood and dirt are practically removed from the hides. This will require about thirty minutes, or until the water is fairly clean after being expelled through the numerous perforations in the circumference of wheel. Take out the hides and spread them, hair uppermost, on the floor. Then split them through the back, strip evenly, commencing with the tail, thereby making two sides from one hide. Consequently, we now have one hundred sides, which constitute a pack to carry through the works. Throw them, as split, into a pit, or pool, of clean, cold water and let them remain there for two days, temperature of water and weather permitting.

Many tanners first split the green cured hides before taking them to the beam-house, and then throw them into a pit of water for a

few days before submitting them to the wash-wheel. By the former method, the work of removing the salt and filth will be greatly facilitated, and when relieved of foreign matter, and the hides uniformly soaked and washed, the splitting is more evenly accomplished than where the hides are partially dried out, through exposure to the weather during transportation. Hides first washed in the wheel should not be allowed to remain in the soaks too long



WASH WHEEL.

afterwards, excepting when the water is cold, as then they are practically freed from salt when coming out of the wash-wheel.

FLESHING.

There are many tanners also that lime their hides before fleshing. This custom is more prevalent in the East, and is done with a concave knife over a beam, or green-shaved over a stake, with a head knife. There are several reasons why neither of these methods should receive encouragement, or be allowed in fact, by those claiming to be practical tanners.

There would be some excuse where tanners are working dry flint African, or South American hides, where the exposure to the hot

sun produces a thin glaze on the flesh, which is very difficult to remove before liming, but, taking a practical view, it will be conceded that it is right at this time that this glaze and nerve should be broken and removed, a little extra labor to the contrary notwithstanding. In the first place, hides intended for whatsoever class of work, will produce greater weight and measure, plumper and fuller in body and flanks, when fleshed with a concave knife properly over a beam, or by the improved fleshing machines, before going into the limes. As the majority of tanners flesh by hand, I will confine this work to hand fleshing before the hides enter the lime, and endeavor to show the evil results from green-shaving, either before or after liming. Beam-fleshing, after the hides are limed and unhaired, is not as objectionable as green-shaving, yet I cannot refrain from entering a protest against this method, for the following reasons : Where the fat and meat is first taken off and the nerve broken, the hide then becomes flaccid and readily adapts itself to the subsequent treatment in the limes. Unless the fat and meat be first removed, it will require a longer time to swell the hide and neutralize the grease, before the hair can be removed. White spots, which are frequently seen on leather, varying in size from a nickel to a half dollar, may be directly traced to this cause. Had the flesh and nerve been removed before the hides went into the lime, this latter agent would have had immediate action, and have caused the hide to swell uniformly when in it, and when going into the bark liquors to feed and become healthy. White spots are seldom, if ever, seen on leather where the hides have received the vigorous treatment demanded, before going into the lime pits.

GREEN SHAVING.

This is the most radical, and we might say barbarous treatment to which the hide can be subjected. By so doing you rob the hide of a good portion of its gelatinous tissue. You will have accomplished one object, however, that of virtually removing the nerve, but what is worse, that which the nerve was intended to protect, the real vitality of the hide, which consequently becomes stunted and ceases to grow and mature during the subsequent treatment in the tannery. It ever after presents a harsh, crusty look and feel, and fails to receive the necessary amount of bark to produce plump, heavy leather. The most convincing argument for those tanners who continue to green-shave their hides would be to pick

out several of the large green shavings and tan them. They would soon learn that those shavings were of the thickness of a sheep-skin, more tough and elastic than the senior portion. Why, then, continue murdering the hides in the beam-house, when a few common-sense experiments will convince the most skeptical, that the glue manufacturer has been robbing tanners of what should have gone into their own pockets? To the writer's knowledge, none of the Western tanners green-shave their hides, which accounts, in a great measure, for the reputation obtained in the suppleness of their wax upper, grain, and other fine leather specialties.

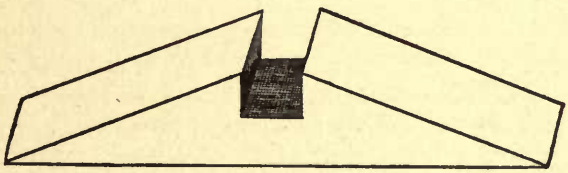
NERVES.

What are these little nerves which have such an important bearing in the manufacture of leather, and upon which so little has been said by practical writers and tanners? Whole columns might be written upon this question and presented to the craft for their consideration.

The nerves form a complete network underlining the entire body of the skin, which nature has provided for the contraction and expansion of the body; otherwise the animal would present to the eye a loose, flabby appearance, after having once been in a fat, healthy, and then relapsing into a poor, sickly condition. The nerve performs the same duty to the animal as do the numerous interlacing cords to a balloon. Consider, for instance, the nerve as the network which surrounds the silk or body of the balloon and which protects it from sudden contraction or expansion. When the balloon is fully inflated, the nerve or net work expands and holds the silk or body in rigid condition; if contraction follows, these innumerable cords close up around the balloon and hold it in position. Thus it is when the skin is taken off the animal, those little nerves hold the fibers of the skin, producing a firm and compact feeling. To produce an elastic feeling those many nerves must be broken. After the skin is relieved of those fetters, it becomes flaccid, and will readily adapt itself to the subsequent manipulations in the beam-house, tannery and finishing departments. Another very important object gained, is that the leather will not "bag up" in tanning, as would be the case when those nerves have been neglected in the beam-house.

To return to the process in question, viz: That of fleshing before going into the lime. In the first place let us look more to the quality than the quantity of the work. By spending two or

more cents extra per hide in the beaming, you will be rewarded four-fold throughout the tanning process, and obtain satisfactory results when finished. In the second place, the beam hands should be fully educated in their work or instructed by a competent foreman. They should not be allowed, under any circumstances, to use the sharp or cutting edge of their fleshers upon the body of the hide in the endeavor to remove the nerves. These should be broken by short, vigorous applications with the smooth edge of the flesher. To accomplish this it requires a deal of manual labor and skill. It is but natural that the beamsters will, when a greater number of hides are demanded of them than can be faithfully done, resort to the easier and expeditious method of shaving them off with the cutting edge of the knife, resulting in "beam cuts," sufficiently deep to greatly injure the splits, besides opening up the cells, so that when the hides have been depilated in liming and de-



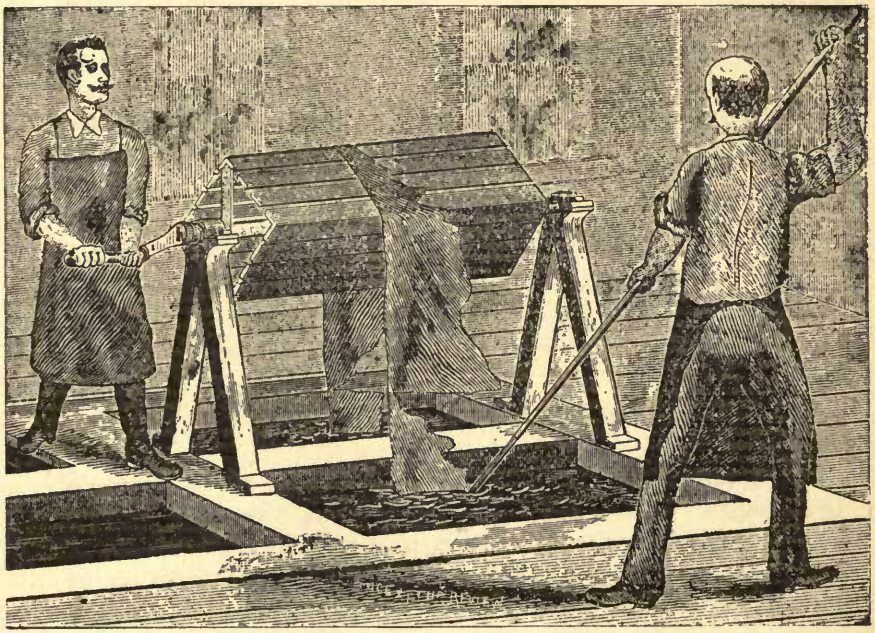
CUT OF KEY.

pleted in bating, the gelatine will naturally ooze from the cells thus opened out.

To prevent the flow of blood from a wound we apply bandages or astringents to heal the same. In place of preventing the flow or oozing of gelatine from the hide, tanners by the barbarous system of green-shaving, and using the sharp edge of knife on the hide, other than in removing the tallow and meat left on the skinning, leave the hide in a condition to purge, lose weight and eventually produce thin, harsh and tinny leather. During the process of fleshing instruct the beamsters to cut a slit near the back strip on the head and tail, one and one-half inch long, and one-fourth inch wide for the purpose of pinning the hides together before going into the lime. After the hides are fleshed, they should again be taken to the wash-wheel and run for ten minutes, so as to thoroughly cleanse them of all impurities brought to the surface through the radical treatment received in removing the flesh and nerves; they are then doubled, hair out, and piled down near the edge of "dead" lime pit.

KEYING THE HIDES TOGETHER.

The wooden keys may be made either of pine or ash ; the latter is preferable, being tough and durable—and four inches long, one inch thick, and three-fourths of an inch wide. In the center of key, cut a slot one-half inch long and the same in depth on the thickest part, and taper off the ends to one-eighth of an inch. When ready to immerse the hides in the milk of lime, commence by pulling the slit from the head of No. 1 through the butt slit of No. 2, and insert the key, throwing each hide into the lime pit, as



HIDE REEL.

connected. Continue the operation until the entire pack is keyed together. The first and last sides should have a wooden float securely tied to the hides, so that in reeling, the operator may readily distinguish the top hide and pass the float over the reel, when with little labor, the entire pack may be changed from one lime to another in five minutes' time. There should be one man to turn the reel and one with pole in hand to evenly distribute the hides in the pit, as per cut. By the use of simple drums, same as in cut, but suspended to the floor timbers or roof above, and operated by

steam power, one man's services can be dispensed with in the reeling. Should the pack of hides go into the lime early in the day, it is advisable that the pack should be reeled on to the plank covering of pit No. 2 before closing down, and immediately after reel them back again, so that the hides, in their then reduced condition, may have free access to the lime liquor. This process will also hasten them on in the liming process.

Having taken as a basis fifty hides, or one hundred sides per pack, and from hides ranging from twenty-five to sixty pounds, we should have an average run of from forty to forty-two pounds per hide. This number and weight would require from one hundred and twenty-five to one hundred and thirty pounds of stone lime per pack; or where working extreme light hides exclusively, one hundred pounds of lime will be ample. No given rule can be laid down for this work, as lime stone varies in different sections of the country. While some lime contains a large percentage of magnesia, other products are almost entirely free from it; therefore it must be left with the foremen of tanneries to use their judgment as to the amount necessary to depilate the hides. The weights, as given, will apply to tanners in Illinois and Wisconsin, or of limestone in the vicinity of Racine and Milwaukee. In making a new lime liquor, fully one-third more will be required. Limes should at least be run off once a month and all sediment and foreign matter be removed. New limes frequently fail to accomplish the purpose in the given time; therefore it is safe to add one more day in the process after cleaning out and re-filling with clear water.

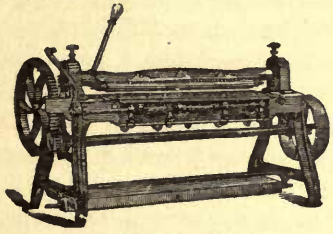
When the limes are in good condition, six days will be required to thoroughly swell the hide and bring it in proper condition for unhairing. Taking but one pack per day, as an illustration, we shall need but seven limes, leaving one as a reserve in case of need. No. 1 may be classed as the "dead" lime and Nos. 6 and 7 the "live" limes. There should be a gradual up grade from the No. 1 to No. 7, and the amount of lime slacked for liming an entire pack should be put into the several pits as the hides are daily changed from one pit to another. Many tanners use the same strength of lime in the first immersion as when coming out for unhairing. This method will do very well for sole leather tanners who lime in as few hours as in days for upper leather. For sole leather, all that is required is for the lime to operate on the cuticle, so as to remove the hair and preserve the gelatine intact; but for

upper leather purposes, a certain percentage of the gelatine must be destroyed, else the desired tough and supple leather could not be produced. Carry along the liming on nearly the same principle as is done in the liquor pits; neither starve nor over-feed, but keep on the up grade from the time the hides go into the pits until limed or tanned. Thus we have one pack going into No. 1, or the "dead" pit daily, and one pack coming out of Nos. 6 or 7, the 'live" pits; consequently the packs are reeled over daily and fresh lime added as changes occur. At the expiration of the time required, reel the oldest pack on top of the preceding pit, remove the keys and then throw the hides into a hot water bath prepared for them, which should indicate a temperature of from 100 to 110 degrees F., and after remaining in the bath for from two to three hours, unhair them. This bath will tend to further swell the hides, open the pores and cause the hair to slip off more readily, and at the same time will aid in liberating from the pores and cells the caustic lime which would necessarily have to be neutralized later in the bate-wheel. The unhairing should be done by a smooth, stunt-edged knife, so that the grain may not be marred, as any imperfections at this stage of the work will show up quite prominently after being tanned. The hair and epidermis must not only be removed, but to the grain should also be given a good, hard working, which will remove, in a great measure, the lime and filth, and save time and expense in the bating process. After unhairing, throw them into the wash-wheel and run them for ten minutes with a liberal supply of water, to remove adhering hair, lime and dirt before going into the bate.

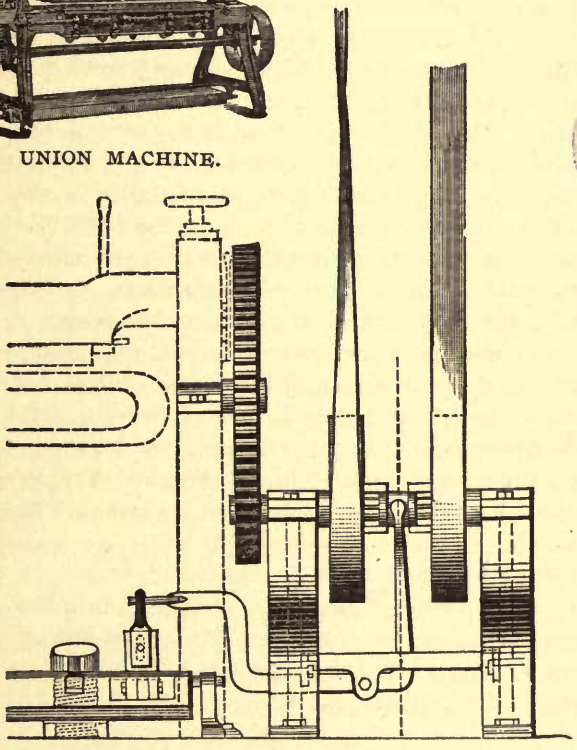
LEVELING THE PATES.

In the first chapter of the series this important branch of the work was overlooked. For this work a second-hand union splitting machine, or a miniature machine of similar construction, and costing about $100, will satisfactorily do this work. No tannery wherein upper leather is finished would be considered complete without the pate splitting machine. It will pay for itself in a few months time, and requires no great skill to operate it. It is well known that the cheek or jole of a hide is thicker than any other portion, and has no value except for scrap leather, when tanned. It costs fully seven cents per pound to tan them, and when taken off they will not bring more than half the money. Besides, when taken off in the beam-house it has nearly the same value as when

tanned, for these portions, like calf pates, are considered the most desirable for making glue and gelatine. Further, should those portions fail to be fully tanned when split off after coming from the tannery, they would have to be taken back to the liquors again to be of any merchantable value. Therefore, as a question of



UNION MACHINE.



FRICTION GEAR FOR UNION MACHINE.

economy, I would earnestly advise taking off the slab in the beam-house, and leave on just sufficient so that when the leather is ready for splitting, another light skiff may be taken off to conform to the butt portion. See cut of machine.

BATING.

We have now arrive at what must be considered the objectionable feature of the work, either in the beam-house or tannery. After

all that science and chemistry have done for tanners, during the past twenty-five years, they still cling to the chicken manure bate, as the only agent for neutralizing the lime to bring the hides in proper condition to unite with the tannic acid. An old sour liquor is bad enough, but a manure bate is simply an abomination, and is one of the prime causes of tanneries having to be located in the back-woods, or away from civilization. In fact, men thus engaged, if single, are frequently boycotted from securing a respectable boarding house, or of going into society or to entertainments. Not only those who are directly engaged in working in bates, but those working in the tannery and adjoining finishing shops are victims of this loathsome neutralizing agent. The aroma (?) will penetrate to every nook and corner of the tannery, particularly when the bate is heated to a temperature of 90° F. For this reason the writer was obliged to marry early in life, that he might take some comfort and escape the many hints and occasional snuffings of the atmosphere, by those who failed to receive a like education in a malodorous tannery. There are advantages to be derived, however, if one is dependent on the horse or steam cars to convey him to his boarding house or home; he can, soon after entering, find ample room to sit down, or even occupy a whole car, should the atmosphere be a little heavy. Notwithstanding the boycottings and inconveniences the tanner is subjected to, there seems to be a mania among young men to learn the art of making leather, and not a few thus engaged are graduates from our colleges and universities.

"What can't be cured must be endured," is an old saying; therefore we will stick to the old style of bating until the wisdom of future ages shall find a substitute. There are several patents for this work, called the chemical bate, etc., which are odorless, and claim to effectually perform the work in depleting the hides and neutralizing the lime. But as a rule, they have failed to receive the attenton of tanners, other than occasional experiments; and should they fail to perform the work demanded on first trial, they are thrown aside and the tanner falls back to the Simon-pure chicken manure.

Before completing the series, the writer will introduce a comparatively new agent, in this country, for unhairing and bating the hides, which is done at one and the same time, and which, from personal experience, produces a far better quality of leather than

when limed and bated by the old method. But as the majority of tanners have not as yet reached the turn in the lane, and are opposed to all "new-fangled notions," we will continue on old fashioned principles and at the same time endeavor to correct some of the abuses.

No specified time can be given for properly bating the hides. Much depends on their condition, the water and the weather, to fully deplete and fit them properly for entering the tannery. An odorous bate, like sweet milk, is seriously injured by thunder showers. Should the manure not be properly fermented before going into the bate, it will fail to produce the desired effect. For this work it is advisable to set up wooden tanks back and on a line with the bates. These tanks should have false bottoms, packed with hay or straw, and near the bottom a plug to run the liquor off into the bates. Put within the tank the amount of manure required for each pack, say three bushels for one hundred sides. Put into the tank warm water and allow it to remain long enough to ferment, and when that point is reached, run the liquor off for use and again fill the tanks and wash them off, as when leaching bark. Never boil up the manure by steam pipe; the properties can be readily extracted with warm water and through fermentation, and the liquid be freely run off, but where steamed up it will pack, become soggy and be difficult to strain off to the pit. Again, excessive heat will pass off in vapor the ammonia properties of the manure and greatly deteriorate its value. The residue of the tanks should be thrown on the manure heaps, and not into the wheel, as is the custom with many tanners. It is not the filth that reduces the hide, but yet it is liable to do great injury. Many tanners still hang to the belief that the more filthy the bate the better it will perform the work required. "Cleanliness is next to godliness," and this truism can be practiced in the beam-house and tannery as well as in the privacy of one's home, and with profit and credit to the tanner.

Chicken manure gathered during the summer and fall will be of greater strength than that in the winter and early spring, therefore it would be misleading to specify a given number of bushels per pack, but to be on the safe side it is better to put in a sufficient amount to cover any deficiencies in quality, and then watch results in the wheel. A strong bate may be readily detected by its ammonia properties. Before running in the liquid, from tank

steam up the pit to a temperature of from 80 to 90° F., then run in the liquid and set the wheel in motion; then throw in the hides. The daily routine of the beam-house work should be as follows; First, flesh the hides; then unhair a pack. This latter cannot be done in regular order until the usual number of limes are filled; then fine hair or work out the bate, so that the pack may be handled in coloring wheels, and be suspended in liquor pits, before closing for the night. This work, consisting of one pack, or 100 sides per day, can be performed by three beam-hands, and one man to do the chores. Therefore, we have practically about twenty-four hours in which to deplete the pack in the bates, but, as before stated, no fixed time can be given for this work, and it must be left to the good judgment of the foreman or operator. By drawing the thumb and fore-finger across the grain, the condition may be readily ascertained, keeping in mind that when the hides first go into the bate they are very plump and rigid from the caustic effects of lime. This condition must be reduced to that of mellowness, the same as before going into the lime. After liming, the hide may be compared to a sheet of zinc, and when properly bated to a dish-cloth. When in the latter condition, it is safe to assume the hides are sufficiently depleted to fine hair, and are ready to go into the liquors. For the work intended, it is not necessary to bate as low as where working for imitation goat exclusively, still no trace of lime should be left in the hides, and to be on the safe side, give the pack a good milling in the wash-wheel, with clear, cold water, after the fine-hairing.

WORKING OUT THE BATE.

When in condition for working, take the hides, as wanted, from the bate-wheel and throw them in barrels of warm water placed between the beamsters, from which they are placed on the beam, grain side up, and give them a thorough working, removing all remaining hairs from body and edges, and forcing, through vigorous applications of the knife, the lime and filth from the pores and cells. The knife should not be too stunt nor yet too sharp to injure, but in a condition to hug the grain in a manner to entirely free it from all foreign matter. The hides are then taken to the wash-wheel for their final washing. Run them for ten minutes with a good supply of cold water, and during that time they will plump up from the effects of their cold bath and will then be in excellent condition to go into the handling-wheel.

CHAPTER X.

COLORING OR SETTING THE GRAIN.

The handling or coloring wheels are the same in construction as the bate wheels, as shown in previous chapter. These are supposed to be near the wash-wheel, but within the tannery. The bottom of wheel pits are cylindrical in form and latticed, allowing the daily accumulations of bark, dust, fiber, etc., to pass through to the bottom of pit. Herein lies one great error in the construction of the England wheel. The cylinder should be practically tight and smooth. Where open, and the slats have sharp edges, there will be far greater wear and tear to both hides and leather during the revolutions of the wheel. In one corner of pit is a perforated box about six inches square, set up to protect the plug leading to the conveyers below the pit for the purpose of running off the exhaust liquor; and on a level with the front edge of pit is a log conveyer connecting with the leaches through which fresh liquor is supplied. This wheel should be kept sweet and clean, and any accumulation of filth should be washed out and passed off into the junk by the aid of the force pump.

Where latticed bottoms are used, it will be found difficult to cleanse the pit properly unless the entire bottom is taken out, and not infrequently have tanners taken out several wheelbarrow loads of dirt, a large portion of which is the nap thrashed out of the hides and leather by being run continuously for one or more days with a view to hasten the tanning. No greater mistake can be made when using the England wheel. It is one of the best labor-saving appliances in the tannery, where judiciously used, and particularly when re-tanning split leather or splits, it will save a deal of handling in pulling up and throwing back the stock, to change the liquors, as is done in an open pit. But the wheel should be run but a few moments at a time, or just enough to change the sides and liquor to facilitate the tanning. When first introduced, tanners flattered themselves that the dawn of a new era had arrived. Nearly every tanner put in one or more of the wheels, but they strangled their would-be benefactor in its infancy by overwork, and robbed themselves through the great waste of gelatinous

tissue. They in time learned that the nap thus whipped out of their leather went under the latticed bottom and eventually to the manure pile, resulting in loose, flanky leather, and unremunerative returns. Consequently these wheels have been largely discarded for several years, but where employed at the present time, it is in a far more conservative manner.

Presuming we have a clean wheel and a pure liquor of about five degrees density, or a third run liquor from the leaches, we will take the pack of hides from the wash-wheel and put the same in the handling-wheel and run for ten minutes; where a continuous current is maintained during that short space of time, it will be found on pulling out the pack that the liquor is greatly exhausted, in fact not much better than water. Hides in their green condition will rapidly exhaust the tannic acid, having been greatly reduced in the bate. They are like unto a sick patient just recovering from a fever; but care must be given that the nourishment is not too strong or administered too frequently until the bloom of health is portrayed on the cuticle of the skin. Had the hides been thrown into an open pit and remained dormant, we should not have given them a liquor of the same density, or not over three degrees, but where every portion is exposed to the liquor, and constantly agitated, there is less fear from over-feeding and better results can be accomplished during the ten minutes in the wheel than in twenty-four hours in a dormant condition. The diamond figure so prominent on the grain of most tannages of rough leather, is produced through long time and continuous revolutions of the handling-wheel. This figure is rather difficult to remove in the scouring and setting. But where the wheel is run but ten minutes, as above stated, there is only the slightest trace of said figure on the grain, and at the same time nearly retaining the satin feeling, as when coming from the bate. A sweet, pure liquor is very essential in the first stages; it should also be cold, and be run directly from the leaches. Tanners make a serious mistake in using weak, sour and often ropy liquors in the handling, or of running a sweet liquor into a filthy wheel that has not been cleaned out for months, as is frequently the case. Such a mess of filth will contaminate the purest liquors from the leaches and cause the grain of the hides to be streaked, and of a dull, brownish color. Fact and fancy may be classed as twin brothers. The tanner who does not cater to fancy nowadays, will find himself at the tail end of the procession, strug-

gling to catch up with those more enterprising. The result of the ten minutes' wheeling in a sweet liquor, providing the lime and filth is thoroughly removed from the hides in the beam-house, will be a uniform and beautiful shade of lemon which will naturally change to that of orange, as the leather progresses in the tanning, especially wherein hemlock bark is employed.

SUSPENDING IN PITS.

The question has been frequently asked: "What is the difference between buff leather and imitation calf?" The former, one of the staple products in the New England states for many years, has been used as a substitute for calfskins. The grain is entirely buffed off and the style of finish does not greatly vary from that of imitation calf, or what is known as "Glace Calf," "Satinoil," "Satin Calf," etc. These later styles have greatly displaced the use of buff leather on account of the milder tannage, resulting in tougher and more pliable leather for fine shoe purposes. The chief difference in the manufacture is in preparing the hides in the beam-house. Hides for buff leather purposes, range from forty to sixty pounds, averaging about fifty-two pounds, and consisting of young steers and cows. In preparing them for the limes, the work does not vary materially, but in connection with lime, soda-ash and brimstone are used; the bating is dispensed with and the hides are merely washed in a wheel with warm water after they are unhaired. The soda-ash and sulphur act as a bate, and the lime used in connection with them is robbed of its caustic properties during the process of removing the hair, imparting to the grain a fine silky feeling, similar to that it has when coming from the bate. The hides, after being fine-haired, are either handled a few moments in the coloring wheel or immediately nailed upon sticks and suspended in the pits. A thicker grain is obtained by this process of removing the hair than can be secured through lime alone. Consequently a heavier buffing can be taken off in the finishing without cutting into the gelatinous tissue. To produce the full flanks and thick grain, stronger liquors are employed, and when tanned the hide is naturally tender, particularly when split down to a light substance.

The tannage of imitation calf, which we will now resume and carry to completion, will be comparatively mild, and the time they are suspended in the pits will not exceed twenty-eight days. The true secret of making this stock will be in the re-tanning after be-

ing split, and not having "tumbled" to this secret, to use a current phrase, many tanners have failed in their endeavor to produce leather of full, fine flanks, strength of fiber and supple qualities, so requisite for this class of stock.

TANNERY AND PIT CAPACITY.

The more modern tanneries are so constructed that the beam-house and tannery are practically one, or they are situated on the ground floor, so that no retrograde movement of the hides may take place after they are once on their journey from the beam-house. It also enables the foreman to keep an eye on the men in both departments at the same time. It will only be necessary to give, at this time, the size of the pits, as former chapters of this series have entered into details as to the construction of tanneries, with diagram of the same. The pits are supposed to be what are known as the "Buffalo" pit, single or double. When double, or wishing to include the full pack of one hundred sides, the pits for suspending should be 8x8 feet, and 5½ feet deep. These proportions will give ample room for suspending the sides. The sticks should be of the following dimensions: Three inches wide, one-half inch thick and about one-half inch shorter than the length of the pit, to prevent wedging or binding when putting in or taking out the pack. Near each end of the sticks, bore a hole one-fourth inch in diameter and connect to them stout cords or lace leather, of sufficient length to insert in the incisions cut by the beamsters in head and butt, for the purpose of keying the hides together for reeling in the limes. At the bottom center, on thin edge of the sticks, insert a brass screw, with gimlet thread attachment, and at a slight angle and projecting nearly one inch, the hook portion being on a line with the stick.

The hides, when taken from the coloring wheel, are placed on a table, grain side upwards, backs to the front. The operator then takes a hand-spring punch and cuts a hole in the center of the back strips, of sufficient depth to secure strength in the handling; he then turns outward the brass hook and connects it with the hide; the screw is then turned back, the point of it coming in contact with the stick to prevent it from becoming detached from the hide during the subsequent handling. The cords at each end of the stick are then pulled through these incisions, slightly tightened, and tied with a single bow knot. There should be no straining of the cords, but let it be rather slack than otherwise, for, as the hides progress in tanning, contraction follows, and should the strain be

too great on the cords the backs will naturally curl, particularly the shoulder portion, and prevent the tannic acid from penetrating those portions. As fast as the hides are connected, throw back the sticks upon the center of pile until such time as it will be necessary to remove and suspend them in the pit, where several packs go into the tannery daily. This work can be performed to better advantage with the aid of another man. But where one pack daily comes in and the same amount goes out, one man can readily do the connecting, suspending, changing of packs and liquors, and also attend to their coloring in the wheel.

Those tanners who have not had experience in suspending, are inclined to the belief that this method is more costly than throwing the hides into pits, and pulling them out daily. But such is not the case; fully one man's time may be saved in the tannery by suspending, and far better results obtained than by any other known method. After the hides are once suspended the labor is slight, and where not crowded in the pits the time is lessened nearly one-half, and, what is of far greater importance, the tanner, by this method, is enabled to secure full, fine flanks, so desirable in the cutting of either upper or sole leather. The liquor for first immersion in the pits need not be as strong as that used in the handling wheel, say from three to four degrees, for, as previously stated, leather lying or suspended in the pits, and in a dormant condition, should not be given liquors of the same density as those used in a wheel and frequently agitated. The following day the pack is changed from pit No. 1 to No. 2. Before commencing the work, run off the exhausted liquor to the junk, and run a fresh liquor into No. 2 pit; this liquor may be a little stronger, and of fully four degrees, but practically cold. Then place wide planks on the stick bearings of each pit, and take two or three sides at a time and carry them from pit No. 1, and lower them into No. 2, with a vibrating motion when touching the liquor so that should any of the flanks be doubled, they may be opened out to receive the liquor. When the pack is changed over, run in sufficient liquor to entirely fill the pit. This operation to be continued daily, each time grade up the strength of liquor, never allowing as weak or weaker runs to be used as in the first immersion. There should be no advancing or retreating. "Onward and upward" should be the tanner's motto, from the time the hides come into the tannery until they are tanned. If the hide once "falls away" for want of sufficient nourishment in the early

stages, that plump, healthy feeling and appearance can never be regained, though liquors of great density be employed. There is as much danger, however, in overfeeding in the early stages as in starving. Hides, after coming from the beam-house, may be compared to the convalescent patient in the hospital ward; each should receive light nourishment until the body or tissue has regained its former healthy condition, when stronger food can be administered without injury.

CLASSIFICATIONS.

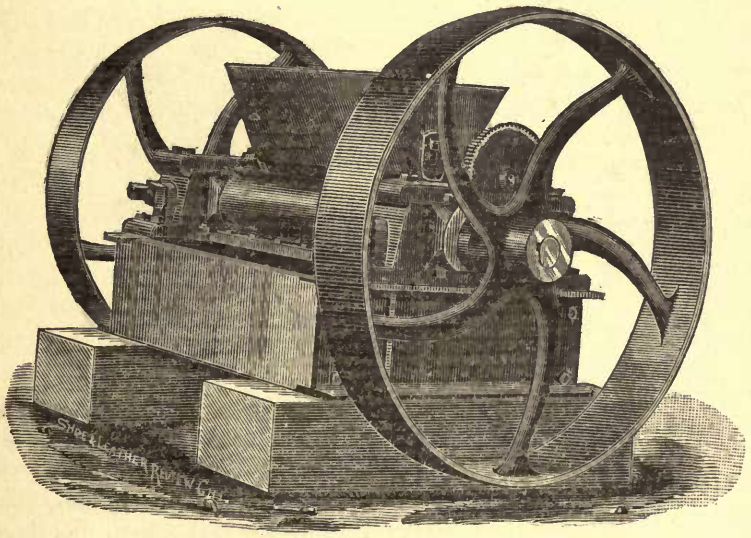
To produce uniform results in tanning, more attention ought to be given to classifying the hides in the hide house. A fine steer, for instance, or cow hide should not be allowed to keep company during their journey through the tannery, with a coarse ox or bull hide. The latter will more greedily devour the daily rations, tannic acid, while those fine textured hides will fall away, resulting in loss of weight and plumpness, so important to the tanner. This can be more systematically arranged in large tanneries, wherein several packs come in daily, but in small tanneries it would not be practicable unless the tanner was making some one specialty, and purchased a straight selection of hides. To secure uniformity in tanning, age, size, weight and composition must be considered. If the overland stage proprietor is purchasing a team of horses, he requires the color in so far only as relates to fancy, but looks to it that the team is well matched as to size, strength, speed and endurance, so that one will not have to bear the brunt of the burden, and before reaching the terminus fall out by the wayside exhausted.

CLEANLINESS.

Next in importance in a tannery is cleanliness. No filth should be allowed to accumulate in the pits. No tannery would be considered complete without a steam force pump, with water and liquor pipe connections. A considerable amount of water is required daily to replace the absorption from the freshly ground bark, waste and evaporation. Therefore, it can be best utilized in washing out the pits. When changing over the daily packs, and when taking out a pack for splitting, have the rubber hose and nozzle at hand, set the steam pump in motion, and give the pits and sticks a good cleansing, passing off the washings to the junk below, to be pumped over on a last run leach for washing out the tannic acid, held in solution, and use the products from it on a newly ground leach.

TIME REQUIRED.

The time required for tanning this class of stock need not exceed twenty-eight days, the same as that for oil grains. During the first two weeks the packs should be changed daily, each time slightly increasing the strength of liquors when the leather will be beyond fear of falling away, and can then remain two or three days in a more distant portion of the yard, called the "relief corps," so as not to prevent the succeeding packs from filling their relative places in line. Those packs, farther advanced, can then be given stronger liquors, of from ten to twelve degrees, as they progress, and at the expiration of twenty-eight days will be practically tanned, showing no trace of green hide in the splitting, still there will be thick portions of the split that require more filling, which can be more quickly and economically done afterward.

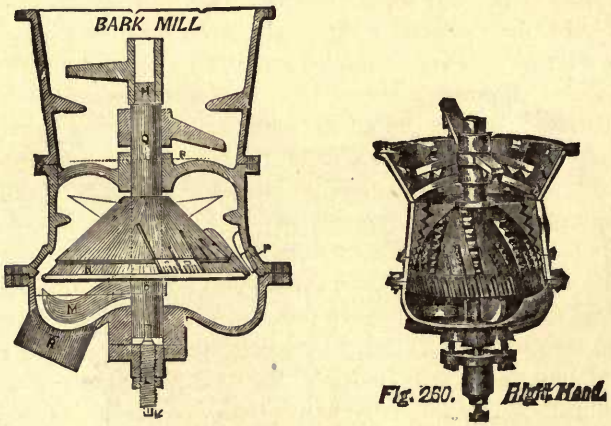


BARK CRUSHER.

CHAPTER XI.

PREPARATION OF BARK AND AMOUNT REQUIRED.

If tanning extremely light hides, two and one-half cords of hemlock bark will be found ample to tan the pack of fifty hides or one hundred sides, and also the splits, whether finished or sold in the rough. The sides, after splitting, need not go back to the tannery again, but should be treated according to the instructions given in the following chapter. The splits require a good filling of bark after being taken off, and are first run for thirty minutes in the drum-wheel, with just enough gambier liquor of fair strength,



BARK MILLS.

to put them in good condition to go into the tannery for completion, which can be accomplished in about ten days. To save frequent handling, throw them into an England wheel and run the same daily for a few minutes at a time, or for only a sufficient period to change the position of the splits and liquor. The latter may be run off and fresh liquor run in without pulling up the pack. This will be found necessary, as on first immersion weaker liquors should be used. For spready cows, fifty to sixty pounds, will require about one cord more of bark per hundred sides, or from three and a quarter to three and a half cords per pack.

GRINDING AND LEACHING.

The most practical and economical way, to the writer's mind, for preparing the bark for leaching, is by crushing, but the immense power required and the consequent friction, have prevented it from being more generally applied. Still, this method is used by many, the bark being first ground coarsely in a common mill, thence passing into the hopper or crusher, when the kernels run through powerful rollers that thoroughly crush the cells and then pass into the conveyor in thin leaves or flakes, and what little dust accumulates in the grinding is firmly packed within the scraps of crushed bark. These scraps may be reduced to powder by the simple pressure of thumb and forefinger, but when in the leaches they swell like a sponge and are held together by the interweaving of crushed fibers, thereby preventing packing in the leaches, and allowing free passage of liquor in the running off.

The tannic acid can be readily extracted, and with little if any steam used in the process. There are other mills receiving a good share of attention which shave or plane the bark diagonally across the cells, the product being in the shape of shavings which lay very light and spongy in the leaches. A saving of some 25 per cent, it is claimed, is made over the old method of grinding. Either of these mills is a decided improvement, and both are saving the tanners much money in their use.

BARK-SHAVING MILL.

Every tanner has his own method of leaching bark, and the number of runs from such leach secured. The conveyor system of carrying the bark from mill to leaches, and the spent bark to the fire-room, has its advantages over the floating system of the bark from the mill, as by this the spent bark cannot be disposed of as readily and cheaply. The press system of leaching is more generally adopted, as by it purer liquors are obtained. The pumping over of exhaust liquors on to head leach, the same passing through and before forced from bottom of No. 1 to top of No. 2, and so on throughout the entire system. By this system the bark is almost continually being percolated, the liquors purified, and of greater density than where the leaching is confined chiefly to that in which the bark is ground. A few tanners have suitable facilities and ample steam capacity for heating their liquors to a very high temperature, or boiling heat, and then pass the liquor into coolers before going into the yard. By this means all foreign matter is extracted, and

what has not passed off in vapor will form in scale, similar to that produced through impure water in boilers, and when filtered through the several leaches, as by the press system, practically if not virtually, may produce pure liquors. But where the tanner uses heat less than boiling point, leaving all the impurities in the bark and liquor, he will find it detrimental towards producing a good, healthy color to the leather. On this principle some men take pills or medicine to clear their livers of bile. If the dose is not sufficient to fulfill its work, the patient finds himself worse than before, as the bile has been stirred up pretty effectually, the same as water or bark liquors at a too low temperature, but not sufficient to pass off either the steam or bile. Therefore, it is safer for the tanner, not having ample facilities for steaming, cooling, etc., to use only medium warm liquors, which are secured by running the spent liquor from junk to leaches, through the exhaust steam box, until the oldest leach is about ready for pitching, and then run on clear water and steam up the same, using the washing to run over on a fresh ground leach.

PREPARING FOR SKIVING.

After being sammied, take one side at a time and lay it on the table and dampen it, with a sheep skin swab and water, to a uniform condition; then go over the grain side with a light dressing of cod and paraffine oil, with two-thirds of the former to one-third of the latter oil in the mixture. When the pack is completed take, for example, twenty-five sides, according to the dimensions of the wheel, which, if built in similar proportions to the stuffing-wheel, will be eight feet in diameter, four feet wide, inside measure, and will contain oak pins irregularly studded and inserted in the circumference. Such a sized wheel will have a capacity for the number of sides specified. No water or steam connections are required for this work. Put in the sides and connect the belt running around the center circumference of the wheel to the pulley, then apply the tightener, and set the wheel in motion, and run it for twenty minutes in the same condition as was taken from trimming table. This pin-blocking process will give to the leather a mellow feeling, and to the sides their natural contour, for after the hides have been suspended to sticks and hung in the pits for four weeks, supported only in the center and at each end, they change their original shape on the back strip through contraction in the tanning process. But during this milling they resume their former character and are more easily manipulated by skiver, splitter and shaver.

SKIVING.

If the belt knife machine is not at hand, recourse may be had to the revolving or thumping machine for removing the flesh. This has hands at intervals, with stone or steel slicker attached, and is of similar construction to the polishing machine. If neither of these machines is at hand, the operator will have to fall back to skiving by hand, with head knife over a stake. But the belt-knife machine is far ahead of anything yet invented for this work, as it is capable of doing five hundred sides daily. The skivings, as taken off, greatly resemble a lace shawl, and have greater value than hand skivings for shoddy work. There will not be found cuts and stabs as in hand skiving. In skiving by machine the sides are reversed from that of splitting, being fed into the machine flesh uppermost, the uneven portions passing downwards, while the flesh is separated uniformly on the entire surface of the side, and, if required, the blood veins may be removed in a measure, where the splits are to be used for flesh finish.

BARB-WIRE IMPERFECTIONS

After the leather has been skived, place upon a table, one side at a time, grain uppermost, and trim off all superfluous parts; then, by the aid of a miniature buffing slicker, snuff off all imperfections caused through barb-wire scratches or horn marks. Should any such imperfections be too deeply cut into the grain, it is not advisable to entirely remove them, for when finished they will show up quite prominently, leaving in places coarse patches which will eventually consign sides so marked to the B, or No. 2 selections. It is very important that the snuffing off of imperfections should be done before splitting the leather, for by so doing a uniform substance throughout the side is secured. It is at this stage of the work that the tanner learns the evil effects of barb-wire fences, and from which he seems to have no redress. He pays for No. 1 hides, to all appearances, but after the hair is removed he finds some seventy-five per cent of the leather more or less damaged.

THE TREACHEROUS BARB.

Tanners, particularly those engaged in making grain and fair leather, have every reason to complain of the deleterious effects on hides from the use of barb-wire fences. However particular they may be in selecting their hides, they are unable to peer into and beyond the hair covering to the cuticle until after they are limed, and the hair removed. Then the numerous railway lines, switches and side-tracks are plainly discernible.

It is safe in making the assertion that fully seventy-five per cent of the hides gathered at the packing houses and throughout the West are more or less damaged by coming in contrct with barb-wire fences. Farmers and stock raisers have spent millions of dollars for wire fences to keep their cattle from running astray, but little did they dream that for every dollar thus spent for self-protection, they have indirectly caused a loss of two or more dollars to the tanners, in hide damage. It may be asked, "What are they going to do about it?" It would be a very difficult matter at this late day to legislate against such a gigantic industry, since the barb-wire has been planted around countless acres of range, ranch and nearly every grazing lot among the farmers throughout the country.

It is claimed, and with some degree of truth, that a simple wire without the barb would fail to keep the cattle in an inclosure, as they would break down the wire or work through the strains, were there no pointed barbs as pickets to warn them of the danger of so doing. Improvements have been made in that of substituting a revolving spur in place of a stationary barb, but from some cause, unsatisfactorily explained, it has not to any extent been adopted. It has all the safeguards necessary to prevent cattle from breaking down the fences, and is far more humane in its workings. It acts on the same principal as the spur to the horse, but it does not tear the hide as the stationary barb does. Perhaps this harmless and humane invention is not controlled by trust monopolies. Otherwise it would have been more generally introduced. Should the tanners

TAKE A DECIDED STAND

in opposition to the use of the treacherous barb-wire, they would in all probability receive from the cattle raisers an answer of about the same purport, as did the patrons of Vanderbilt's railway lines —"The tanners be d---d. We are not raising cattle for the hides, but for beef purposes." Very true, but when the hide covering which has protected the beef during maturity brings more money per pound than the beef, it is about time the tanners had some say as to what they should pay for hides thus badly disfigured while on duty protecting the beef.

But how is the result to be secured? There is nothing easier should the tanners consult their own interests and work together. First, let those who are making sole, harness, skirting, grain and fair leathers a specialty, ascertain the average damage caused by barb-wire scratches in miscellaneous runs of hides. Let them also

keep a daily account of the number of blemishes per hide, and when the leather is finished, estimate the loss solely caused by this damage, as most all other blemishes are discernible when purchasing the hides, and are sold on their merits. Learn what proportion of the leather finished goes into the B and No. 2 selections, which should have made No. 1 had it not been for the barb-wire scratches. Compare notes with your neighbors. Give the results of the same through the trade papers. Establish a price consistent with the loss through the use of barb-wire fences, and demand your hides on that basis.

"UNSIGHT AND UNSEEN."

Buying hides at the present time is on about the same principle of the boys who swap jack-knives "unsight and unseen." After the interchange is made one discovers he has a knife handle without blades; the other may have one or more parts of blades, but finds the horn or ivory handle missing. Whenever this "unsight and unseen" hide damage shall have been decided upon, the tanners should individually and collectively demand the reduction of prices in round lots, commensurate with the actual loss sustained. It may seem strange, but such is the fact, that the hides of older and larger cattle are freer from scratches than those from young cattle. The older cows and steers have learned wisdom. After one or more attacks of the barb-wire fence they give it a wide berth, while the young heifers, cows and bulls frequently get on a rampage, and, instead of covering themselves with glory as to which were the fleetest of foot and the highest jumpers, cover themselves with barb-wire scratches from horns to tails.

The present and prospective supply of hides is more than ample for all practical wants. Tanners need have no fears of hide scarcity or famine, and hides that are not suitable for one class of leather can be put into another class and sold on their merits. Then tanners can return the compliment and say, "The farmers and cattle raisers be d——, if they choose to mutilate the hides let them pocket the loss."

CLASSIFICATIONS.

The leather is now in condition to be split, but we will first select those sides most suited for the class of work intended, viz: Imitation calf or glove leather. In the first place, plumpness of shoulders and flanks should receive careful consideration in the selection. It is not as important that the grain should be free of

scratches, unless too deeply engraven, as it is that this class of leather should be buffed on the grain before finishing; but avoid putting in too spready or large sides, plump steers and heifers being a more desirable pattern. Put large spready cows, where not too badly disfigured, into oil shoe grains. Those of a thinner and spready nature, which are free from barb-wire scratches, put into imitation goat, as this style of finish requires the grain to be practically free from scratches or abrasions, as the grain is not buffed off in the finishing as in imitation calf and oil shoe grains. The coarse neck steers and cows and those otherwise badly mutilated on the grain, should be put into wax upper or collar leather. When splitting for imitation calf it will be necessary to make five selections, viz: Light, light medium, plump light medium, medium, and heavy medium, and varying in substance from three to six ounces per square foot. These classifications are better known in the trade as "A. L.," "A. L. M.," "A. P. L. M.," "A. M.," and "A. H. M.," in the first selections, and when of the second selection, B is prefixed, and of the third, C, or No. 2. The above grades also apply to oil shoe grains and imitation goat, and other fine leathers for shoe purposes.

ASSORTING AND TRIMMING THE SPLITS.

If making splits of flesh finish exclusively, select out the same when trimming, leaving all the offal on those destined to be retanned and sold in the rough state. Those intended for flesh finish should be selected carefully as to cuts, scores and other imperfections on the flesh that cannot be practically removed in the skiffing and shaving. Trim closely, removing all thin portions on shoulders, also keeping in mind that the plumper steery splits are better adapted for grain finish, or to be sold in the rough, for weights above medium and heavy medium are unsalable in flesh finish, and ranging from eighteen to thirty-two pounds per dozen when finished.

When the leather is not skived too close it is advisable to take a skiffing from the flesh side by either the belt-knife or union machine, the former is preferable, but first take the slab from off the grain or split side, then take a thin skiffing, just sufficient to split the blood veins, when they are passed over to the shaver to touch over any spots that the machine knife failed to remove, unless done at the expense of the thicker portions when the slight traces of veins would have been obliterated altogether. We must

not lose sight of the fact that flesh finish splits are intended to represent wax calfskins, and are very generally used as a substitute in making shoes. No better pattern could be given to follow than the traces of blood veins on the palm of the hand, neither too prominent nor inconspicuous, for where too prominent when finished they will have to be classed as "B's," or second selection, and when entirely removed would be similar to the grain finish, and would fail to command the prices paid for flesh finished splits.

RETANNING THE SPLITS.

After shaving, take say one hundred splits and put them into the drum-wheel, then put in two pails of strong gambier liquor, and about the same of water, or bark liquor; no more liquors should be put within the wheel than the splits will absorb, then set the wheel in motion and run for thirty minutes. Continue the same until some five hundred splits are thus prepared, and then take them to the tannery; this number will make a pack for a large sized handling-wheel or double pit. To save time and labor throw them into the England handling-wheel, in a liquor of eight to ten degrees strength, and run the wheel but a few moments at a time, or just long enough to change the position of splits and agitate the liquor. As the strength of the liquor becomes exhausted, pull the plug, and run it off into the junk, and run in fresh liquor from the leaches of twelve degrees density, or a first run, and continue the changes as mentioned several times daily, and at the expiration of ten days the splits should be well tanned and filled, and withal weighty. It should be remembered that we are now working to secure weight, as also a fine finish, and should the splits be slack tanned they would naturally be open, coarse, and ragged when finished. When well tanned they will carry more grease than where starved, or wherein the cells are not thoroughly filled with tannic acid. Although not a believer in the use of gambier exclusively in tanning upper stock from cow hides or calfskins, still I have great faith in it as a retanning agent, in connection with hemlock bark. The latter is of a more harsh and brittle nature than oak bark or most other tanning agents, while the gambier liquors are of far greater density, and one of the strongest tanning agents; it has a tendency to relax the fibres of hard tanned leather, and produces more supple and tougher leather than that wherein hemlock bark is used exclusively. Were it not for this fact, the pack of splits, which we have been retanning in the England wheel with

a strong bark liquor, would be taken to the scouring table ; but before doing so, and after having been well drained by laying in pile, take them again to the drum-wheel and give them another dose of gambier liquor, of fully twenty degrees density, and all they will absorb without waste, and then run the wheel for thirty minutes, after which the splits will not only become more weighty and greatly improved in color, but will be mellow; the former rigid feeling, as coming from the tannery, will be broken, and the splits will more readily submit to the subsequent manipulations.

SPLITTING.

The belt knife machine was first introduced to the trade along in the 60's, but great trouble was experienced in securing expert operators, as at that time it was one of the most complicated machines used in the leather manufacture. But of late years great improvements have been made in the knife grinding apparatus, as also in manipulating the knife jaws, so as to hold the knife in firm position. This machine is now a great favorite with tanners making light and fancy grains, book-binding and pocket-book leather. It performs its best work the nearer the belt-knife comes to the grain, and the leather requires less shaving than that split by the union machine. In heavier grades of leather, such as wax upper, heavy boot grains, and collar leather, complaints are made that it will not perform its work as satisfactorily as on light. Yet the writer has operated it on all classes of leather, and with highly gratifying results. In leveling splits for flesh finish, the union machine will do its work more evenly in removing the slab from grain or split side. Then take them to the belt-knife machine and remove a skiff from the entire surface, of sufficient size to split the veins, and this can be done far more safely and evenly than is generally done by hand.

This machine is very generally used for skiving in large tanneries, wherein heavier grades of leather are made, and the splitting is done by the union machine ; but for fine light leather it is used in preference to the union machine, there being no strain whatever on the leather as it passes through, consequently no tearing or disfiguring the sides. One hundred sides per day is considered a good day's work on imitation calf for the union machine splitter, including the trimming of heads and flanks, whereas with the belt-knife two men, one to feed in the sides, the other to gauge and pile them away, can split from four to five hundred sides daily,

and at the same time secure larger splits and a greater percentage of offal. When splitting very light leather it is advisable to first stone out the head and flank portions on the grain side by the jack machine, as the leather is fed into the machine and against the revolving knife, in place of being wound over a cylinder and drawn against a stationary knife, as with the union machine; in the former, there being no strain on the sides, the contracted, or pleated portions, will be apt to become sucked and run down to a thinner substance than the more plump and firm body portions.

SHAVING.

It has been the custom to shave over the entire side after coming from the splitting machine, and at a cost of about four cents per side, the same being paid for splitting. But I consider this a waste of money and material, providing the splitter is competent to perform the work. The shaver, however expert he may be in handling the head-knife, cannot produce a more even surface on the body portion of the side than when it comes from the machine, if properly split. There will be portions of the side, however, that will demand touching over on the stake, particularly the flanks and heads, wherein the machine knife failed to touch them, and more especially on their flanks, as all adhering flesh must be removed, otherwise when the sides are ready for buffing any lumps on that side will injure the grain when the buffing tool is applied. Therefore, I would advise for this work, the same as for oil grains, belly shaving, at a cost of about one and a half cents per side. When assorting the leather for the several named styles of finish, it is well to have some mark, so that each may be readily detected while going through the splitting and other departments. That which represents the greatest number, for instance, imitation calf, on which we are treating, need not be marked; but on the oil shoe grains punch one small hole near the tail, on imitation goat punch two holes, on wax upper or collar three holes. Where this method is strictly adhered to it will save much time and annoyance during retanning, scouring, setting and stuffing. It is also advisable when in the act of assorting to note the lot number of hides stamped upon the butt in the beam house, as also their character; if the hides are No. 1, for instance, no mark need be put upon them, but if B's, second selection are employed, stamp "A" or "B" upon them. The former is more frequently adopted, for should the buyer discover the letter "B" branded upon the sides he would infer it

was the second grade of leather he was paying a No. 1 price for, whereas some of the best sides in pattern and quality are found in the "B" selection, and as frequently the opposite in the No. 1 selection. Also note the beamster's private marks, which will give a tracer to any poor workmanship in the beam house. In numbering the purchase lots of hides commence at No. 1, and go to and include No. 8, and then return, for should No. 9 be used it would be confusing should the number become reversed when stamping and indicate No. 6. No. 10 and above that would require two characters, and, as the lower numbered lots would be finished before the duplicate numbers would come out of the yard, it is not practicable to use higher numbers, as the object for which it is done is passed upon while going through the splitting department.

RETANNING THE SIDES.

We now come to one of the most important processes in making imitation calf or glove grain, that of retanning. To produce the required firmness of flanks and buffing qualities, the fiber and gelatinous tissue must be slightly contracted through the application of astringents, and no tanning agent has yet been introduced that will secure those results so satisfactorily as gambier and sumac. Hemlock bark has superior filling properties, but is of too harsh a nature, and as the leather at this stage is practically tanned with hemlock bark, we now need to combine equally astringent agents, those which will tone down the harsh nature of hemlock and produce that satin feeling, which has given to this style of leather its great popularity among makers of fine shoes. This combination not only produces firm, supple and tough leather, but greatly improves the color and foundation for receiving and retaining the grain black. The great popularity of the dongola kid tannage is largely due to the use of gambier in tanning. The liquor is prepared as follows: Take one bale of gambier, say 250 pounds, and cut it into small pieces and put into a tub, capable of holding eighty gallons of water; insert a steam pipe and thoroughly dissolve the gambier, and when fairly cool skim off all foreign matter, and it is then ready for use. Put within the drum-wheel thirty sides of split leather and ten gallons of the gambier liquor; then add two gallons of dry American sumac, and as much water as will be required to make the leather wet, without dripping, and set the wheel in motion and run it for thirty minutes. The operator will need to use judgment as to the amount of water put within the

wheel; much depends on the condition of the leather. If not too dry, two pails of water will be sufficient, but should the leather fail to fully absorb it during the process, lessen the amount of water in order to prevent waste of liquor when taking the leather from the wheel. The leather is then packed in boxes by doubling the side, flesh outwards, and in a snug pile, there to remain for ten to twelve hours before scouring. The stock will improve on the condition it is in when coming from the wheel and grow the same as when immersed in a pit containing a good liquor. The cost of retanning by the above method will be from seven to eight cents per side. Far better results will thus be accomplished in thirty minutes with the above ingredients, than would be obtained in an open pit containing a strong liquor for several days. Where hemlock tanned leather is employed for grain finish, the black will fade and grow rusty by age, unless sumac or gambier are used for retanning, after it has been split. Oak extract will answer the same purpose, and may be used alone with good results on imitation goat and oil grains.

SCOURING AND SAMMIEING.

The scouring is done by either hand labor, or scouring machine, as circumstances permit. It is necessary to scour only upon the grain side. Dip the side into a tub of clean water, as wanted, and spread it upon the table, grain upwards, and go over it with a stone tool, until all the old grain is distributed, giving to the head and flanks an extra stoning; rinse off well with clean water, then go over the grain again with a steel slicker, removing all marks of the former tool, at the same time expelling from the pores and cells all impurities, also the bloom which naturally accumulates on the cuticle during the tanning process.

Should these foreign matters be allowed to remain on the leather it would fail to absorb and retain the required complements of greases in the stuffing. But where the filth is thoroughly worked out of the hides in the beam-house, and the purity of bark liquors maintained, as recommended in a previous chapter, it will not be found necessary, at this stage, to give the leather such a thorough scouring, for by so doing a good percentage of the tannin and filling properties are forced out, more particularly when scoured on flesh and grain side; neither should the leather, after coming from the tannery or wheel, be thrown into a hot water bath, nor be allowed to remain there for any length of time before scouring.

We have been jealously guarding against producing loose, open and flanky leather, while it was on its journey through the tannery, and after being split and re-tanned with a view to further improve the flanks, we now come to the wrecker of our hopes and aspirations—the scouring machine. It may be considered as the twin brother to the England handling wheel, when improperly used; and wherein the leather has received the needed attention in the tannery, it is a mooted question whether this branch of the work may not be dispensed with altogether, and a portion of the time and labor carried to the setting account. To produce firm and unyielding leather it must be scoured and set out firmly on both flesh and grain by machine, but to produce supple and elastic leather, that will yield to the strain of the foot, the "set" should not be entirely removed, therefore the writer would not advise scouring or setting the leather on the flesh side, especially for the class of leather on which we are practically illustrating. After being scoured on the grain and slicked off, go over the surface with a light coat of cod and paraffine oil, equal parts, and fold in book form and send them to the lofts for drying. In drying scoured leather for mill stuffing, let it be done as quickly as possible, particularly when intended for the class of stock wherein fineness of fibre and firm flanks are requisite. All of the water should be absorbed, and, as it progresses, the light dressing of oil on the grain side will replace, in a measure, the evaporation and prevent the grain from becoming crusty when dry, and will act as a preventive, when dampening the leather for stuffing, from absorbing too much water.

DAMPENING THE LEATHER.

When the leather is thoroughly dried out, weigh it up in batches of two hundred pounds each; this amount, by the usual test, will be equal to three hundred pounds of sammied leather, or when in proper condition to go into the stuffing-wheel. Then take the leather to the stuffing room wherein it is presumed there is a tank, having steam and water pipe connections. In winter, heat the water to about eighty degrees Fahrenheit, as this will greatly aid in maintaining a more uniform temperature in the stuffing-wheel. Then fold the sides in book form and dip into the water quickly one-half of the side, flanks first; then reverse the side, dipping in the back portion, then open out the side and pile on to a table, grain uppermost, until the number of sides for each wheel is thus

prepared, being careful to put a mark between each batch, to prevent any mistake in the weight when getting them ready for the wheel. After the several batches are dipped and spread out, take a sheepskin swab and water and touch up any dry spots noticeable, and, at the same time, should the flanks be too dry, give to them a larger amount than to the fine body portions, as it is very important that the coarse flanks should be well filled with grease. Wet leather, or comparatively so, will carry more grease than when too dry, but it requires a few moments more time in the process, and a higher temperature, to expel the moisture from within the pores and cells before the grease can replace it. The dampener's motto should be: Neither too wet nor too dry, but just right. When just right there should be no sign of dry leather on any portion of the side, and yet not too wet to be ragged. The safest test is to double the side on body and flank portions, and with the thumb and forefinger give a good pressure on the grain, and should there be signs of water oozing from the pores, it may be considered as in good condition to receive the grease. After dampening, pack the sides into snug piles, flesh out, and cover them over with wet leather, or bagging, and let them remain thus for twenty-four hours before stuffing, when the leather will be found of uniform dampness and fairly ripe. It is the practice of many tanners to dampen their leather, and then immediately take it to the stuffing-wheel, but it is much better to keep two days' stock ahead of the stuffer, when the leather will take the grease more uniformly and retain it when setting, and what is fully as important, the leather, on grain and flesh, will show a delicate lemon shade, in place of being mottled and streaked. A good dampener and stuffer cannot be prized too highly in their respective departments. The latter has a great responsibility, and through any neglect or oversight, as to the temperature of his greases or wheel, great loss will ensue.

STUFFING WHEEL AND GREASES.

In the third chapter of the series, a detailed description was given of the construction of the wheel, and it will be only necessary to repeat as to its size and capacity in order to provide sufficient accommodations for the several batches of dampened leather now ready to be immersed into a bath of hot greases. The wheel should be eight feet in diameter and three and one-half feet wide, inside measure; not a few are built four feet in width, but the former dimensions are more practicable and large enough for all purposes.

Use direct steam in place of coils of pipe for the heating, and I would further suggest as a safeguard, that a steam valve and stop-cock be connected to the supply pipe, the former in the usual place and the latter near the turned axle. It frequently happens that the seat of the valve becomes so worn by pinching it, that the steam is allowed to escape into the wheel when the leather is in and in motion. Again, the stem of the valve, if not kept well packed, will, through the constant vibration of the wheel, cause it to open, and, unless the operator be on the spot at the moment, the batch of leather would not be worth taking from the wheel. By placing the stop-cock near the axle and below the valve, it will act as a double guard while the wheel is in motion. The steam jacket-kettles should be set up within a few feet of the stuffing wheel, with steam connections and drip pipes, and should be capable of holding some five hundred pounds of grease each. Where direct steam is employed for heating the wheel, it will be advisable to construct a ventilator to and through the roof, having directly over the wheel a hopper-shaped mouth, with trap attached to open and close at will.

NATURE OF GREASES.

For this work we will use seventy-five per cent of brown grease and twenty-five per cent of English degras, nearly opposite in nature to that which was recommended to be used in stuffing oil shoe grains. For the style of finish intended, greases of a more filling nature will be required than for oil grains. Sod oil is frequently used as a binder, in the proportion of five per cent, but when such heavy greases as the above are used, this latter may be dispensed with; besides, it contains from five to ten per cent of water and if united with the other greases in the steam kettle, will foam and cause trouble. If employed, it should be heated in a separate kettle, or poured into the wheel cold, and there united with the brown grease and degras; the comparatively small amount of sod oil used will not seriously conflict with the required temperature. Fill the kettles with greases of the above proportions and turn on the steam, and when melted and at a temperature of 140 degrees F., shut off the steam. A higher temperature can be used—such as 150 degrees—but where the leather is in good condition, it is better to be on the safe side. Before using, stir it well in the kettles and then insert the thermometer. Let it remain for a few seconds, and if too hot, tone it down by adding

more grease in same proportions. The wheel should also indicate about the same temperature as the grease. This is done by admitting direct steam through the axle of the wheel and continuing it for about fifteen minutes, or until the wood-work is thoroughly heated, then open the door and turn over the wheel until the opening is at top center, so that the excess of steam may escape; then test the temperature by inserting the thermometer upon a long stick with hook attachment and hold it near the top center of the wheel long enough to secure the desired test. A quicker way, and what may be considered a good guide for the operator, is to insert his arm into the wheel and apply the hand to the pins, and when this can be done without burning, it is safe to put in the leather and grease. The old saying, "Practice makes perfect," is a true one, and an expert stuffer will seldom resort to the thermometer for securing the temperature of either the wheel or greases.

STUFFING.

Pull the plug out at the bottom of wheel and run off the condensed steam into pans, and when cool, skim off any accumulations of grease for future use. Take a draft of leather previously weighed up and sammied, and place within the wheel and on each side of the door, leaving an open space in which to run in the grease. We now have within the wheel, for instance, two hundred pounds of dry leather, or what is equivalent to three hundred pounds of sammied leather. For every one hundred pounds of dry leather put within the wheel seventy to seventy-five pounds of grease, according to the tannage; therefore we now have practically within the wheel two hundred pounds of dry leather, and one hundred and forty to one hundred and fifty pounds of grease. The leather and grease must be put in expeditiously, for as soon as the required temperature of grease and wheel is ascertained, the wheel should be set in motion as soon as possible, else it will be found difficult to maintain the required temperature to force the water from the pores and cells of the leather, to be replaced by the grease. Run the wheel for twenty-five minutes, then throw off the belt, open the door and again set the wheel in motion and run it for five or ten minutes to cool off the sides. If, at this stage, the leather has fully absorbed the grease, the wheel comparatively clean, and the leather having withal a rich, greasy feeling, it is pretty conclusive evidence that the condition of the leather, temperature of grease and wheel were up to the required standard. As the sides are taken from the

wheel, throw them over poles for a few moments to become fairly cool before taking them to the setters. The leather is then packed into boxes and covered with bagging, and taken from thence for setting as wanted.

SETTING.

As previously mentioned, this is one of the most important branches of the work, and when properly done, the character of the side is well established. But in place of setting out on both flesh and grain, as done on the oil shoe grains, we will set this stock upon the grain side only, and for the following reason: This style of finish will not require boarding on grain and flesh, as for oil grain finish, which has a tendency to break the rigid feeling produced by setting firmly on flesh and grain. Imitation calf, or glove grain, is simply soft-boarded on the flesh side, and only one way, consequently it will be detrimental towards producing the satin feeling and elasticity demanded, should the leather be settled together too firmly, particularly when the setting is done by machine. To avoid this, we will first place the side on the setting table, grain upwards, and then give it a good stoning, commencing near the butt, working out the "baggy" portion, then passing towards the hind shank, and spread them out naturally without pleating; the setter should then turn towards the shoulder and fore-shank and repeat the operation, always keeping in mind the alignment of the back strip. However even the hides may have been split through the back strip in the beam-house, it will be noticeable at this stage that the backs are greatly out of line, and as a guide for the setter, he should place the butt and head portions on a line to conform to the edge of the table, and, having secured the set, commence with a semi-circular motion and work the stretch towards the uneven portion until an alignment of the back is secured, and the entire side perfectly smooth on the table; flank at full spread, when the setter takes a steel slicker of fairly smooth edge and repeats the operation, removing all marks of the stone. When taking the side from the table, care should be exercised that the set is not destroyed. For drying, the writer would advise the suspension of the sides to the racks lengthwise; first firmly secure tenter hooks at intervals on racks whereon the butt portion will hang, and opposite that, ropes or strong cord. After the sides are set, and while on the table, cut an incision near head and tail; then take the side from the table carefully and first connect the incision on butt with tenter

hook, and then put the cord through the incision on head, and draw the cord naturally—not too taut—and tie in single bow-knot. This method will be found a decided improvement over that of hanging on sticks, crosswise; for by the latter method, the bend, when dry, will present a warped or contracted appearance on the grain which is very difficult to remove in the buffing.

DRYING.

Too little attention has been given to the drying of stuffed leather. The temperature of the drying lofts should not exceed seventy degrees F., nor should there be too much light or air admitted. It is better that the leather should hang up for four or five days than be dried through a forced drying by steam and air in ten to twenty-four hours, as is frequently done. Let the windows be shaded with blinds or curtains and just sufficient air admitted, in an indirect way, as was more particularly dwelt upon in a previous chapter on "The Construction of Tanneries." When dry, pack down in piles, the sides at full spread, and when convenient let them remain in pile, well covered, during one or two weeks to ripen up, when the leather will buff and finish with more pleasing results.

SLICKING AND BUFFING.

If catering to fancy, the slicking may be dispensed with, and in its place the flesh side may be whitened by slicker. But the latter method of rough whitening costs nearly two cents per side more than slicking, and in the writer's judgment, the quality of the stock is deteriorated rather than improved. In the first place it is a waste of time and material; and when the gelatinous tissue is opened out, after having been stuffed and set out on the flesh or back of the sides, the former greasy, satin feeling and healthy appearance are destroyed, and in place the flesh is harsh, the complexion less attractive and withal of a sickly hue. Therefore, we will treat on the simple method of slicking which is less expensive, and one that will give facts rather than fancies. This is done by placing the sides, flesh uppermost, on a hard table and using a common steel slicker tool, fairly sharp, so as to remove any foreign substances in order that, when placed upon the buffer's table, grain uppermost, any collections, from whatsoever source, will not cause blotches on grain during the buffing process. The buffing table should be firmly constructed, of a smooth plank top surface, or may be made of slate or marble and some six inches higher on the front edge than

a finishing table, and having a pitch of some six inches towards the back edge. On the top of the table put a bolster, a large side of tanned leather, or a whole kip of good substance, and leveled by the splitting machine to a uniform thickness on the body portion. First put upon the table surface a coating of flour paste; then take the thin flanky portions of the bolster and connect it to the underneath front edge of table, and then, with a stone tool and slicker, set the bolster firmly and smoothly to the table. There let it dry, and a good foundation will be secured on which to buff the leather. For this style of finish it will be necessary to buff a trifle deeper than for oil shoe grains. As far as practicable, all imperfections, such as barb-wire scratches, should be removed in the buffing, but care must be taken not to go too deep—merely separating the cuticle from the corium; otherwise the finish produced would be similar to that on the flesh side, as in wax upper, kips and calf-skins. The first cut is termed "roughing," and when a sufficient number have been thus treated, a finer edge is then produced on the buffing slicker, and a "snuffing" cut is given to the grain by a sweeping motion from back to flanks, removing any remaining marks or imperfections when a slight nap is raised, imparting to the grain a fine satin feeling. When the flanks are thin, and practically free from scratches, go over them lightly, barely splitting the cuticle. The cost of this work is fully two cents per side over that of oil shoe grain of similar measure. No dampening of the sides upon the grain is required wherein heavy grease, and plenty of it, is employed in the stuffing.

BLACKING.

A durable and clean blacking is made as follows: Take nine pounds of copperas, one-fourth pound of epsom salts, six ounces of ascetic acid and one ounce of nut-galls. Mix and add two gallons of soft water; then insert steam pipe and thoroughly dissolve the ingredients. Turn the mixture into a barrel prepared for the purpose; then add forty gallons of water, condensed steam preferred, and you have a black fully equal, if not superior, to that made from cider vinegar, and at a cost of one cent per gallon. As soon as made, it is ready for use. Should the leather be slack tanned, or of a loose, ragged feeling, put within the barrel four to five gallons of strong gambier liquor, in lieu of the same amount of water; this will tighten up the grain and prevent it from "piping," when finished.

Near the blacking table is supposed to be the sig barrel, capable of containing from forty to fifty gallons of logwood liquor. Directly over the barrel is a pulley connected with the floor timbers. Take a coarse gunny bag, capable of containing one-half bushel of chipped logwood, and when filled, tie a cord around the neck and connect it with the pulley, so that the contents may be raised from out the barrel at a sufficient height to drain and permit the blacker to have free access to the sig after it has been thoroughly steamed up by the forcing of direct steam into the barrel, the condensing of which will supply ample water to the logwood and of the purest quality. When putting the logwood into the bag, put in also sal-soda of the size of a hen's egg, or of sufficient quantity to draw the strength from the wood. Much depends on the condition of the leather as to the amount of sal-soda used. If very greasy, a larger amount will be required, but care should be taken that the blacker should not use it too freely, as it is not only injurious to the leather, but when finished a white scum will appear on the grain, which is quite difficult to remove. This result is quite frequently laid to the oils used in stuffing, but may be directly traced to the too free use of salt and alkalies. Fresh logwood should be replaced daily, where large numbers of sides are being blacked. Lower the bag with the contents at intervals, to further extract the strength from the wood, and maintain at all times an even temperature—near boiling heat. There is no danger of burning the leather, as the sig is put on in small amounts and well rubbed in with a stiff brush. To produce a clean and durable black, the sig, or logwood, must be well rubbed in. Its color on first application will be purple, but when the grain is fully saturated, it changes to that of brown. Care should be taken, however, not to put on too much sig, only sufficient to cut the surface grease to enable it to readily absorb the black. This latter is applied cold, and by the use of a softer brush, made from horse-hair. It requires no great exertion to apply the blacking, if the side is properly prepared with the logwood sig, as the grain then takes the color instantaneously. The sides thus blacked are then hung up on sticks for a few moments, to temper before being glassed, and when taken down, pile them at full spread on the table or floor, black to black, and cover them over, but it is advisable that the glassing be done at about the same time, as the fibers can be settled together better in the then damp condition than when exposed too long to the heat or air.

GLASSING AND OILING.

Glassing out of the black is one of the most important manipulations in the finishing. The table should be firm and of smooth surface; if not, recourse may be had to a leather bolster attached to the face of the table. First go over the side with vigorous strokes with a smooth glass tool and settle the fibers and tanned gelatine well together; then go over again with lighter strokes giving particular attention to the flanks and head, removing all marks of the tool; and should there be noticeable spots where the blacking failed to penetrate, touch them over with the sig and blacking before proceeding further. As glassed, hang up the sides until they are thoroughly dry; then trim off all ragged portions. It has been the usual custom, for leather finished on the grain side, to oil it after all other work had been performed, but for this style of finish the oiling should be done before pasting the sides. When oiling, pile on the table, as far as practicable, grain up, and heads to butts, so that after being oiled the sides may be matched and piled down, black to black, which will prevent the flesh side from being smeared. The proportions of oil are seventy-five per cent of best cod to twenty-five per cent of paraffine, the latter of twenty-five gravity. Mix and apply it warm, giving to the firm butt and shoulder portions a good dressing, and let the leather lay in pile until the oil is absorbed.

PASTING AND SOFT BOARDING.

It will be necessary at this stage to make a kettle of paste, which will not materially differ from that used for wax upper, calf, kip and flesh splits, though not of such body as to crack or peel off, as the fine grain surface will not receive it as readily as on the flesh.

GRAIN DRESSING.

To obviate the greyish appearance on the grain, through the use of flour, it will be necessary to put into the kettle before cooking, one quart of the dressing as used for the oil grain, in connection with beef blood, and made as follows: Take eight ounces of extract of logwood, one ounce of bichromate of potash, two ounces of prussiate of potash, and eight quarts of soft water—condensed steam preferred. Apply live steam to the mixture until fully dissolved and then let it cool and settle.

FLOUR PASTE.

Take one pound of sifted flour, one-half pound of laundry soap, one pound of cake tallow, or brown grease, one quart of the above

grain dressing, and two gallons of soft water. First moisten the flour, or just sufficient to make a thick batter, and knead it until all lumps are broken; then reduce to the consistency of milk by adding the balance of the water. Cut the soap into thin slices, as also the tallow, and put into the flour solution. For cooking the paste, a small steam jacket kettle is the best, there being no fear of burning, or of an excess of water, as when using direct steam. If the latter is employed, make an allowance of from one pint to one quart less water in the kettle, according to the distance of the steam pipe from the boiler. Cook slowly for thirty minutes, when the flour, soap and tallow will have become thoroughly united and the paste the consistency of a thick jelly. Turn into shallow pans to cool.

PASTING.

When pasting, put only one side at a time upon the table, and rub the paste well into the grain, and that no excess be left on the surface, the sponge ought to be soft and practically clean. Hang up to dry and wipe off the table before continuing the operation. It will require but a few moments to harden the paste and temper the leather, so that it may be in condition for the glassing. Care should also be exercised in keeping the backs or flesh side clean. There is nothing that attracts the eye of the buyer quicker than a spotless back, and when using a black paste, as recommended, the backs would become smeared unless the paster be careful in taking off the sides, as pasted, and immediately after wiping off the table. Pack the leather, as dried, upon a portable wooden horse, or truck, and take it to the graining table.

SOFT BOARDING.

The leather is then soft-boarded on the flesh side, commencing at the hind shank and working with cork-board diagonally to the head. Should the leather be fairly firm or "snappy" at this stage, board again straight up and down from head to butt. These operations give the required satin feeling to both the flesh and grain, breaking the crust and producing a uniform shade to the flesh—and more striking wherein gambier and sumac are used in the re-tanning.

GLASSING.

The table for this work should have a perfectly level surface, or a leather bolster placed thereon. Hand labor is preferable to machine, in glassing out of the black and paste, as the flanky portions are not broken as by a machine wherein high speed and

greater pressure is applied. The glasser need not apply the same vigorous strokes as when glassing out the black, as the fibers were or should have been, well settled together during the first operation. He should be careful not to pleat the grain, and to apply only the required strength to break the crust of the paste, in order to produce a smooth satin feeling to the grain surface without breaking through the paste. The flanks require special attention, and when the leather is of the desired temper for cementing the fibers and tanned gelatine together, the glassing will materially improve the quality and appearance, and secure a good foundation on which to put the final finish-gum.

GUMMING.

If a particularly bright finish is desired, it may be procured by using a larger proportion of gum tragacanth. The most popular, and that which will not show the defects or imperfections of the grain, caused by barb wire scratches, is a lusterless finish, which will also greatly improve the feeling of the grain surface. Gum alone has a hardening tendency, but when mixed with paste, it is relieved, in a measure, of its harsh properties, and can be applied to the leather more evenly and scientifically. Therefore I would advise the compounding as follows: Take sixty per cent of dissolved gum, and forty per cent of paste, the same as made for pasting, and mix them together. Strain through coarse toweling and reduce to the consistency of cream; to every gallon so strained, add one gill of the black dressing; this black, together with what was put into the paste before cooking, will give to the grain a beautiful rich black, and aid in cutting the surface grease on the leather, while in the act of gumming, thereby securing an indestructible finish. The gum should be applied with a soft lamb's-wool sponge and rubbed well into the pores, care being taken not to cover more surface of the side at a time than what the first dipping of the sponge can complete. The movements of the arm must be rapid and no attempt should be made to go over the side again after the dressing begins to harden; if so, the grain will present a streaked appearance when dry. The final strokes should be given straight across from back to flanks, and *vice versa*, and then finish up on the entire length of the back strip, and from three to four inches in width. When preparing the leather for gumming, match the sides as far as possible and pile in batches on the gumming table, heads to butts. The same precaution should be taken in

keeping the backs clean in gumming as in pasting, and allow the leather to hang up on the sticks until thoroughly dry. When matched in the gumming process, the sides may be taken from the sticks when dry, two at a time, butts to butts and black to black, which will save unnecessary handling in the endeavor to match them when measuring, or putting them into packages for shipment. To secure a desirable finish, leather should be gummed on a clear day or in a warm room.

MEASURING AND CLASSIFYING.

By the aid of the measuring machine, now in very general use, greater accuracy is obtained than by the use of the old-time frame. The number of square feet and fractions should be plainly and indelibly marked upon the butt, near the tail. Having selected out the largest and most spready sides, when splitting the leather to put into oil grain, we will now have a fairly uniform pattern in the imitation calf, ranging from sixteen to nineteen feet, and varying in substance from three to five ounces per square foot, and if desired for boot backs, it is made of six ounces or more.

When assorting for quality and classifications, place upon the assorting table one or more hundred sides, grain up, and examine each side closely for imperfections and pile them upon a table in the rear in book form, flesh outwards, assigning each side to its respective place. The following classifications are then made in substance and quality: A H denotes No. 1 and heavy; A H M denotes No. 1 heavy medium; A M, No. 1 medium; A P L M, No. 1 plump light medium; A L M, No. 1 light medium, and A L, No. 1 light, each of which grades are placed in separate piles. When they are of the second selection, "B" is prefixed to the various substances and put in separate piles. When of the third selection, No. 2 or X is substituted; but few, however, of this latter class will be found when the proper attention is given to the selecting when splitting. The average of No. 1, or "A" leather secured, will be about seventy per cent, should the leather receive the required attention in the tannery and finishing departments. The several grades are then put up in bundles containing one-half dozen each, with backs to the front of table, and as far as possible, black to black, the bottom and top sides being flesh outwards, and are then folded in book form, and the quality and classification marked upon each package. When ready for shipping, put two bundles together, backs to flanks, thereby making an even pack-

age. As previously stated, leather, like fruit when first finished or picked, should be placed in cases for ripening up before putting them on the market, when convenient to do so, and every tanner would concur with me that his stock improves at least ten per cent in feeling and appearance in one or two weeks time, thus excluded from the air and the frequent changes of the atmosphere. Therefore, I consider it a good investment for tanners to provide themselves with practically air-tight cases in which to put their finished leather when awaiting sales, and when shipments are made to enclose the packages in strong wrapping paper, protecting it from dust and dirt while in transit. The American tanners might pattern after the French of taste and neatness in putting up their finished product. We have to cater to fancy nowadays, and just so long as fancy is willing to pay the bill, it should be gratified. First excel in the quality of your products, and maintain the standard at all hazards; cultivate a taste for displaying and putting up your specialties and reward will be sure to follow.

A competent assorter of finished leather can save his salary several times over by good judgment in the use of the trimming knife. By trimming out some unsightly portion, a hole near the edges, or in straightening the backs to give character to the sides, many would go into the "A" selection which would otherwise be consigned to the "B's," or second selection and sold at from one to two cents less per foot.

CHAPTER XII.

SULPHIDE OF SODIUM PROCESS.

The writer promised, before completing the series, to introduce a comparatively new agent, in this country, for depilating and bating the hides, as a substitute for lime and chicken manure. This agent is none other than sulphide of sodium. It has been employed more extensively in England and on the continent, while but few tanners in the states have adoped it, and then have applied it more particularly upon sheep, goatskins and horsehides. In the previous work on liming and bating hides for fine shoe purposes, I have in a measure endeavored to modify the caustic effects of lime, as also to correct the evil of too low bating by the use of chicken manure for the purpose of neutralizing the lime before the hides are immersed in the tannic-acid. Although lime

and chicken manure have been the chief ingredients employed for centuries in depilating and depleting the hides, for the want of a better substitute less harmless in its nature, there is no reason why tanners, during the closing years of the present century, should not have more generally adopted this method, or at least have given it a fair trial, and have become somewhat familiar with its use by repeated experiments.

The writer had been prospecting for many years to find a substitute for lime and chicken manure, having become convinced those agents were twin relics of barbarism in the tannery, and not until about 1873 did he receive a ray of light, and then through the receipt of a circular on the use of crystallized sulphide of sodium, as manufactured by Dr. E. DeHaen, at his chemical works, near Hanover, Germany. Determined to give it a fair trial, I sent to the agents, Toel, Rose & Co., 17 South Williams street, New York, for a sample package, containing one hundred pounds. I trust the reader will have due patience in following me in the numerous experiments and overlook the frequent use of the personal pronoun, in giving the details of the work, as the experiments and results were obtained by the writer personally, not wishing at that time to let others into the secret, should it prove to be all he had anticipated. In the first place, the sodium is in a crystallized form, and put into barrels containing from five to six hundred pounds. It should be kept from the air and in a dry place, and well covered up, as otherwise it easily attracts water, dissolves and gets weaker in properties. Its action upon hides and skins is similar to that produced by lime, soda-ash and brimstone, and being in crystallized form, it is very handy for immediate use.

At the time the experiments were made, I was tanning for rough leather, employing green-cured hides of about fifty pounds average. The first trial was made by mixing the sodium with that of slacked lime, and using it as a paste by applying it with a broom to the hair surface, rubbing it well into the hair, and then folding the hides in book form and piling them into a snug pile and covering them with a cloth or wet hides to exclude the air. At the expiration of twenty hours they were taken from the pack for unhairing. The hides were prepared in the usual way—soaked and fleshed—then thrown into a pit of clean cold water. For hides of the above description, I used five ounces of sodium per hide, or two and one-

half ounces per side, which is the maximum amount recommended by the manufacturer. Some objections were found to this method, although the hair slipped off easily on the body portion; but the edges, pates and shanks that did not receive a thorough impregnation of the mixture, showed a resistance in yielding to the beamer's knife. This process would more properly apply to sole leather hides, where extra weight and firmness were the objects to obtain, but for rough, harness, upper or calfskins, where a certain amount of the gelatine must be destroyed and the fatty matters neutralized to secure supple and elastic leather, it failed to produce the desired effect.

I next took a green-cured steer hide from the soak, it having been previously fleshed, and which before soaking weighed sixty pounds. This was to be an extreme test to convince me whether the hide could be injured by the excessive use of sulphide of sodium, and the amount of sodium was trebled and put into a tub, it being first dissolved in the proportion of one pound to one quart of hot water. I next took two pails of moderately strong milk of lime from the lime pits, and put into the tub with the dissolved sodium. The hide—two sides, were then put into the tub and continually agitated, and in ten minutes the sides were fully depilated, but lacking that plump, rigid feeling, as when coming from the limes. The sides were then thrown into the wash-wheel and run for a few moments and then given to the beam-hand for unhairing. I will say at this stage the hair was pretty effectually removed in the wash-wheel, and was of no commercial value; the strong alkalies acting upon the hair so instantaneously have a tendency to reduce it to a paste or pulp. But the grain surface, when worked upon the beam, was mellow and of a satin feeling. The sides were again submitted to the wash-wheel for five minutes with a good supply of water, and were then fine-haired, the grain, in the meantime, retaining its mellow feeling the same as when coming from the bate. After fine-hairing, the sides were again thrown into the wash-wheel for two or three minutes and from thence into the handling or coloring wheel. The coloring of the grain, at this stage, was of a greenish shade, which gradually disappears as the hides progress in the tanning, and is substituted by that of orange. There was missing the usual rough and caustic feeling on the grain, as produced by the old

process of liming, and instead of spending days of anxiety in liming, and in bating to neutralize the lime in preparing the hides for the bark liquors, the chemical properties of the sulphide of sodium, in combination with the lime, had been performing the double object required in those few moments. The flesh having been first removed, the mixture acts readily on that side, and any particles of grease or fatty matter adhering, are neutralized while action is being had on the hair side. The old enemy, lime, as when used singly, is robbed of its caustic properties when combined with the sodium, consequently no bating is required to neutralize the lime, and the hides go into the liquors in a plump and healthy condition, in place of being reduced to the condition of a dish-rag in the bates.

The sides, after coloring, were tagged, and with others of the old process, were suspended in the pits for rough leather tannage, the results of which will be given later on. Subsequent experiments convinced me that hides depilated by the above process will exhaust the liquors much more readily, and should be fed accordingly. After several such radical tests and others of a more conservative nature, and jealously watching the progress of each, I was forced to the conclusion that more satisfactory results could be obtained, both in quality and weight of leather produced, and I then entirely abolished the old process and commenced to fill every pit with hides thus prepared. The bate-wheels were transformed into depilatories, and from that time on the bate nuisance was abated. The beam-house and tannery, in place of being an abomination and stink-pot, was, as by magic, transformed into a sweet-smelling institution.

The hides were prepared, fleshed and washed, as has been recommended in a previous chapter, and then thrown into what were formerly the bate-wheels, with a preparation of sulphide of sodium and milk of lime, and the wheel run, off and on for three days, but only for a few moments at a time, or only sufficient time to change the position of the hides and solution, so that free access may be had to each. Pinning the hides together and reeling from one pit to another frequently, will answer the same purpose.

For upper leather purposes, the strength of the solution should be graded to conform to the texture of the hides or skins. Should the saving of the hair be of greater consideration than the extra

percentage in gain of weight, and a heavier grain for buffing, three days' time will be required in the solution, and the hides should then be taken out and thrown into a hot water bath of 110 degrees F., and there remain for two or three hours before unhairing. During the depilating process in the wheels, a portion of the hair will become detached from the hides, and whenever a pack is taken out the loose hair should be removed from the wheel by a long-handled wooden rake; otherwise it will contaminate all subsequent introductions of sodium and lime. For the required time, as mentioned, and when making a new liquor, dissolve from two to three ounces of sodium per side, and for a pack of one hundred sides use about thirty pounds of stone lime, and after being properly slacked, use only the pure milk, retaining the sediment in the tub. Those desiring to make experiments should try the long and short time process, and use judgment as to the amount of lime and sodium to produce the required results. There need be no fear of injuring the hides by too free use of the sodium; still, I would advise going slow until several experiments have been made, keeping in mind that the experiments, as given, were through the use of Dr. DeHaen's sulphide of sodium, as there are several brands now on the market with which the writer has not had experience; but in all cases, whether for upper or sole leather, I would advise using the sodium in connection with lime, and in the pits, rather than painting the sides on the hair, which I consider neither practical nor economical. For sole leather tanning, I would suggest that the solution of sodium and lime be made of sufficient strength so that the hair may be removed in from five to six hours, and then manipulated in the regular lime pits, the hides keyed together and reeled from one pit to another, every hour, and at the completion of said time, reel them into the hot bath to remain for two or three hours before unhairing. If a harder grade of acid leather is desired, the hides may go into the acid baths after being fine-haired, and then rinsed with cold water in the wash-wheel. But when making non-acid sole leather, that which will produce full flanks and a heavy grain for buffing, the sulphide of sodium used in combination with lime, will secure those desired results, and a greater percentage in weight of leather can be secured than by the ordinary method of liming and bating.

The pack should be changed daily during the first three weeks

of their immersion and fresh liquors run in from the leaches. Hides prepared by the sulphide of sodium process will absorb the liquors more readily than those by the old method of liming and bating. Consequently care must be taken that the packs do not become hungry or fall away from want of nourishment. During every change of packs, slightly increase the density of the liquors and the leather will grow and take on weight like the school boy who periodically has his pockets filled with sweet apples.

We will now see what progress has been made with those sides on which the first experiments were made. Sixty days was the usual time that was employed in tanning for rough leather, wherein the hides were prepared by the old process, and about ten days in soaking, liming, bating and the beam-work, and the average yield was about fifty pounds of rough leather from one hundred pounds of green-cured hides, or fifty per cent of leather.

This is considered about the maximum percentage for hemlock rough leather, wherein the hides are handled frequently in the liquors and finally laid away to ripen up. But the method in question was, by suspending on sticks until fully tanned and then taken off the sticks and thrown into an open pit containing a first run or twelve degree liquor there to remain for a few days for filling before being taken to the lofts for drying. The two sides that were tagged and carried through the tannery in the usual manner were readily detected from those that were limed in six days, and bated for twenty-four hours, by their usual plumpness in flanks and shoulders, besides having a much thicker grain. They were tanned through without sign of hide, but the pores and cells were not thoroughly filled for rough leather tannage, wherein weight was a consideration, but was more than sufficient for finishing directly into oil grains, glove or imitation goat. The two sides were taken from the sticks with the others and thrown into a pit of first run liquor from the leaches, and handled daily for five days, when they were given a light dressing of oil and then taken to the lofts for drying. When dry the flanks, shoulders, and the body portion were remarkably plump and fine, and the color, which was at first of a greenish shade, had changed during the tanning process to a lemon tint, and the sides weighed thirty-seven three quarter pounds. Thus it will be seen that this hide, weighing sixty pounds in green-cured condition, and afterwards taking off the flesh, ears, nose and dew-

claws, produced about thirty-eight pounds of rough leather, or at the rate of nearly sixty-three per cent of leather from one hundred pounds of hides. What was equally encouraging, the leather was of excellent quality, of fine and compact fiber, tough and fairly firm, without being hard and unyielding. It must be remembered that this hide was carried through the beam-house by the "lightning" process, that is in ten minutes time, which included the liming or depilating, unhairing and fine hairing. At a little later period full packs of leather worked with the sulphide of sodium process, but in a more conservative method in its application, requiring three days time, were taken from the pits and dried out, and which gave an average yield of from fifty-three to fifty-five per cent of leather from one hundred pounds of hides. The rough leather produced by the sulphide of sodium process found a ready sale, and commanded the highest prices for finishing into harness, wax upper and boot grain.

I would advise tanners who are making a specialty of imitation goat, book-binding or pocket-book leathers, wherein the leather is split down to a very light substance not to go too extensively into this process, until after several experiments have been made with the sodium, and then by using it in a mild form, for the following reasons: By the use of sulphide of sodium a thicker grain is produced than by the use of lime and hen manure, and when split down to a very light substance, the grain becomes tender. Again, leather suited for imitation goat finish must have a thin grain to produce the desired character and prominence in the print. Where too thin, it would be found difficult to throw up a figure in the cork-boarding to resemble the real goatskins. In all other respects the quality of the leather is superior, being of a tougher fiber, finer flanks and of a supple and elastic nature, so desirable for fine shoe leather.

For boot and shoe oil grains, glove grain and imitation calf, where the grain is buffed off in finishing, I consider the sulphide of sodium process especially adapted, as also for slaughter sole, oak and union crops and backs, which are also submitted to the buffing operation to produce a uniform finish and light color to the soles when made into shoes. This process will also be of great value to tanners making sole and upper leather from dry flint hides. There will always be found in this class of hides, many that are

sun-burned, particularly those coming from Africa and South America, and it is a difficult matter to work them in warm weather; to soak them sufficiently long to bring the hide back to its original condition, putrefaction would set in, and unless the hides are made pliable before going into the lime, all subsequent labor is lost in the endeavor to produce plump and healthy leather. For a soak of fifty whole hides intended for upper leather, and averaging some twenty pounds each, dissolve one pound of the sulphide of sodium in hot water and pour into the pit, previously filled with cold water; mix thoroughly with plunger and throw in the hides. This has a tendency to not only preserve the hides during the soaking, but will soften up the sun-burned portions and greatly facilitate the unhairing process at a later stage. After being immersed two or three days pull up the hides and examine their condition. Those that have yielded more readily to the water and sodium, throw aside, and carry them along by first milling in the wash-wheel without water until a friction is created, and the former rigid feeling broken, then let into the wheel a bounteous supply of water until the hides are practically freed from blood, dirt and manure, when they will be in good condition for fleshing over the beam. The balance of the pack, should the hides show no sign of putrefaction, may be thrown back into the soak again after lying in pile a few hours to partially sweat them, when they will soften more readily in the solution. It will not be necessary to run off this solution and fill the pit again with clear water until the entire pack is soaked. If in cold weather, and the water is cold, the same may be used with some replenishing of water and sodium for several successive packs, as the ammonia, blood and filth accumulated will facilitate the soaking of dry flint hides; but care must be taken that this may not be carried too far, and that the hides be pulled out frequently and then select out such as yield more readily. For sole hides, of greater average weight, add one-third to one-half more of the sodium in the soaks and treat in the same way, being careful not to use such a quantity as will loosen the hair too freely while in the soaking process, else a loss of weight would ensue when the hides are later immersed in the sodium and lime solution for completely removing the hair. For soaking dry kips and calfskins, a comparatively small amount of sodium per skin would be

required, and may be regulated by the average weights, although skins of finer texture require a stronger solution to effect the desired object than do heavy, coarse hides.

The leather manufacture, unlike most other manufacturing industries, requires so long a period to convert the raw material into leather, that tanners are naturally shy in adopting new methods, for when the first packs are ready for the finishing the entire yard is filled with the stock thus prepared, and should it fail to come up to expectations great loss would ensue. This uncertainty has prevented many tanners from getting out of the old ruts in which they and their fathers have followed for generations. When the writer, after having made several experiments in the use of sulphide of sodium, and when, having become convinced of its practical utility, he was then somewhat chary in filling the yard with stock so prepared, and is free to admit that many days and nights were passed in fear and trembling as to the outcome. But when the first packs came out, and the leather was thoroughly tested in the rough and finished state, all misgivings disappeared like dew before the morning sun, and he then unhesitatingly declared in favor of sulphide of sodium over lime and chicken manure for depilating and depleting the hides.

No exact formula can be prescribed in the use of sulphide of sodium, than can be given wherein lime and chicken manure are employed for obtaining the desired results. Much depends on the weight and class of hides used, and the quality of the several products of lime and sulphide of sodium, as also that of chicken manure. Therefore, I would advise tanners to first make experiments with one hide, of the average class they are working, and note results. One great objection to its introduction has been through the opposition from the "beamsters," the men employed in handling the hides. Many of them have been educated to the old-time principles, and, like their employers, are loth to encourage any new formulæ, and have, in many instances, to the writer's knowledge, discountenanced the use of sulphide of sodium by ingenious predictions as to the evil effects it would have on the hides. The writer had this experience, and had he been guided by the repeated objections from this source, and the imaginary results which were sure to follow, by unhairing the hides from out a bath of sulphide of sodium, and immersing them in the liquors in one and the same day, he would never have learned the true value of this

substitute for lime and chicken manure. The old saying, "Be sure you are right, and then go ahead," is a true one, and will well apply to this innovation on old-time principles. There are but few tanners who are free to acknowledge the injurious effects of lime and chicken manure for swelling and reducing the hides, and the constant care and anxiety attending their use, but how few of those are there who are willing, or have the courage to take the initiative, or to even follow, until compelled to do so through self-protection?

The question will naturally be asked, "How is the lime, which is employed in connection with the sulphide of sodium, neutralized wherein the bating of the hides with chicken manure is dispensed with?" This question may be answered more intelligently by practical chemists, but certain it is, however, the lime is thus neutralized by the combination process, the same as with sole leather hides when immersed in the sulphuric acid baths, or to that of putting two bull dogs into a pit to prove which is the conqueror. In buff leather tannage no bating is required, as soda-ash and brimstone are used in connection with lime, which robs the lime of its caustic properties, or neutralizes it, as it were, during the swelling process, and no injurious effects are noticeable when the hides are immersed in the tannic acid. Similar results are obtained through the use of sulphide of sodium, whatever the constituent parts may be, and though lime may be used freely in connection with it, no bating with chicken manure will be required to neutralize the lime.

Henry R. Proctor, F. C. S., in his text book on tanning, says: "The substance, as manufactured by De Haen, of List, Hanover, is in small crystals, colored deep greenish-black by iron sulphide, which must have been held in suspension at the time of crystallization. If the salt be dissolved in water, and the solution be allowed to stand, this is gradually deposited as a black sediment, leaving the supernatant liqour perfectly clear and colorless. Sodium sulphide is now manufactured from tank waste in a much purer form by Schaffner and Helbig's process, of which Messrs. Gamble, of St. Helens, are sole licensees. The crystallized salt is SNa^2 10 Aq., and therefore contains 69.8 per cent of water."

As previously mentioned, it was during the year 1873 that the writer made his first experiments with sulphide of sodium, and, after adopting it as a substitute for lime, etc., he was tempted to

publish an article in the *Reporter*, the only trade paper then in existence, on the merits of sulphide of sodium, and the result of his experiments, with a view to obtain further information from tanners who might have had more extensive use of it. The result was letters were received from tanners from all sections of the country, who were then anxious to become acquainted with its use, and from only one tanner did I learn that he had used it, and then on sole leather only, and said: "He would back up all that I claimed for it." That tanner, if my memory serves me right, was Adolph Rose, of New York. He had been using De Haen's sulphide of sodium for one or more years on sole leather hides with gratifying results. The writer has never had the pleasure of meeting that gentleman, but would advise sole leather tanners who contemplate using this agent to correspond with him.

It was then counseled by the manufacturer of the sulphide to use it in connection with lime or pipe-clay, in the form of paste, and smear the hair side with the paste, and allow the hides to remain in snug pile for fifteen to twenty hours before unhairing. This method was more particularly for sole leather hides, with a view not to disturb the gelatine, and that action should be had directly on the hair. But after several experiments in that direction, I would discountenance the application of the sodium in that form, but to use it in connection with the milk of lime, and in the pits, and for heavy sole leather hides, by pinning them together and reeling them from one pit to another frequently, or continuously, and make the solution of sufficient strength to operate on the hair in from five to six hours time, and then reel them into a hot-water bath of from 100° to 110° Fahrenheit, and there to remain only a few hours before unhairing. By this method the action of the sulphide and lime is confined to the hair, without disturbing the gelatine of the hide, and if making non-acid slaughter sole, the leather, when tanned, will be fuller in the flanks, of a thicker grain for buffing purposes, and more weighty leather can be produced than by lime alone. If a firmer quality of leather is desired, the hides may be run through the acid baths the same as when the hides are prepared by the old process, but they will have that dark, underlying strata on the grain, through the caustic effects of sulphuric acid, though not as pronounced as wherein lime is employed exclusively.

Several tanners, during the time these experiments were made,

were induced to experiment with the sulphide of sodium, and sent for sample packages for that purpose. One particular instance may be mentioned. The writer was visiting Milwaukee and happened to go into one of the then prominent tanning establishments, wherein wax upper, kip and harness leather were the chief products. The principal greeted me, on entering, in a cordial manner and informed me that he had read something about the use of sulphide of sodium, and that he was going to give it a trial, he having previously ordered a sample package of one hundred pounds. He asked me to give him some points as to the mixture and application of it to the hides, which service was freely tendered, and we went to the beam-house for that purpose. Not having much spare time, I informed him that we would take one hide and carry it through by what was termed, "the lightning process." The beam hands were engaged in fleshing hides into the lime. I took from the package fully one-half pound of the sulphide and dissolved it in one quart of hot water and poured it into the lime tub, employed for slacking lime; then put in about three pails of milk of lime from one of the lime pits, of moderately fair strength. One hide, or two sides fleshed, were then taken from the soak and put into the solution and by continual agitation, in seven minutes time the sides were taken out and thrown into the wash-wheel, and run for two or three minutes, and were then unhaired, the hair slipping off easily, in fact a good portion of it came off in the wheel. They were then fine-haired and again washed in the wheel, until clean, and immediately put into the coloring wheel and run for about ten minutes, when they were treated the same as his regular packs were in the tannery. My object in adopting the quick process was to convince the manager that the hides would not be burned by the use of sulphide, even when applied in powerful doses, having before tried the experiment, as given in this chapter, on one steer hide, and the results when tanned. For the benefit of those who may be induced to try a similar experiment, I will say that not one tanner out of ten would continue it, and would become skeptical as to adopting the longer time process. Why? For the simple reason that the hide after being in a condition to go into the liquors, presented an unattractive appearance on the grain side, being of several shades in color, and withal looked like the hands of a washerwoman, after having completed her day's work, yet of a fine silky feeling on grain and flesh, as when limed and bated in the

usual manner. I plainly saw that the proprietor and workmen engaged were incredulous about making further experiments, and after requesting him to watch that hide during its journey through the tannery and finishing shop, and compare results with those treated by the old process, I left him, with the impression that my friend would have no more use for me, or for sulphide of sodium. But what was my surprise and joy to meet this tanner in Chicago about three months later, and grasping me by the hand, uttered the following expression: "D—m it, ——, that hide that you put through by the lightning process made the best piece of leather I ever handled; I never saw anything grow in the liquors like it, or make as fine and tough leather. It not having been weighed in the green condition, I cannot tell the exact percentage of leather received. But I tell you if I only knew how to handle that stuff, I would fill my tannery with hides prepared by the sulphide of sodium process."

The above is pretty conclusive evidence that sulphide of sodium can be used of great strength, without injury to the hide, though the hair is worthless, and for this reason I would recommend the quick process for sole leather hides; not so radical treatment as was applied to the hides experimented upon, but in a few hours time. Tanners having the courage and facilities to make tests, and put them in practical application, would, I feel convinced, receive greater gains, and leather of improved quality, by this process in the beam-house, and by suspending the hides on sticks in the tannery pits.

CHAPTER XIII.

HARNESS LEATHER.

Hides for this work consist of heavy cows and native steers, and free of brands. Tanners making a specialty of harness purchase largely from the packers, as those hides are taken off and cured more uniformly and have few, if any, cuts and scores on the flesh. Hides ranging from sixty pounds and upwards are more generally employed for harness leather manufacture, and it is quite important that the grain and flesh should be practically free of imperfections, for unlike most other classes of finished leather this is not split, which in a great measure removes the imperfections from the flesh side. The most objectionable feature that tanners have to contend with in the purchase of native packer steer and cow hides are horn marks on the hair side, caused by transporting the cattle long distances in cars to the packing houses, and not infrequently the hides are badly disfigured by coming in contact with the horns of their companions. As a rule, the hides are not trimmed as close for harness leather manufacture as for upper leather. Even the long shanks and the entire pates and joles are often finished, which present a very unattractive appearance, and which are practically worthless in the manufacture of harness. As stated in the preceding chapters, it is not good economy to tan and finish glue stock, and all such unsightly and worthless appendages should be cut off in the hide-house and sold for glue stock, for which they have far greater value.

The preparing of the hides in the beam-house does not materially differ from those intended for upper leather, with one or two exceptions. It is not advisable to lime these hides as high or to bate as low as for boot and shoe leather. The gelatine should not be destroyed to the same extent as for upper, where pliable and supple leather is the chief consideration. It should be the aim to protect the flanks and loose portions as far as possible when liming and bating the hides, and have them go into the liquors in a fairly plump condition. For this work I would advise harness leather tanners to make some experiments with sulphide of sodium, the formula and results obtained through the use of which were given in the preceding chapter. There might possibly be some objections raised against the use of sulphide of sodium for this work on account of its producing a thicker grain than by liming and bating

the old way, for, as a rule, harness makers desire a thin grain on the leather when cutting for the several grades of work, but I have never, by any plausible argument, been enlightened as to the thickness of the grain being detrimental to its use for harness purposes. On the contrary, the thicker the grain the finer it is, and it will not "pipe" up in use as will leather of thin grain.

The time is not far distant when harness leather, like oil shoe grain and imitation calf, will be finished by buffing or snuffing off the entire grain. Who will take the initiative in this reform? In the writer's opinion it would indeed be a reform on old-time methods. The greatest stride made for generations in the manufacture of harness leather was that of wheel stuffing, and although meeting with great opposition at the outset by cutters of the leather, it has now come to stay, and the leather so produced is of far superior quality and is practically water-proof. Tanners have always held to the theory that the grain, or the thin cuticle of the hide, was a very important agent in preventing water from entering in the pores and cells of the leather. That theory has been exploded and now the styles of leather which are enjoying an extensive demand and which are, or can be made, virtually water-proof are finished by buffing off the entire grain. The great objection heretofore in wearing boots and shoes with the grain on was that after a short time they would become hard and the grain would "pipe" up and become rusty, unless liquid dressings were used, and then given frequent applications of oil and tallow. But where this cuticle is removed the former tinny feeling is also removed, and the shoe may be blacked the same as a calfskin or kip finished on the flesh side.

Therefore, I would advise this class of tanners to use the sulphide of sodium for the purpose of producing not only fuller flanks and better gains, but also a thicker grain, so that when finishing a buffing may be taken off and then have a good foundation left on which to finish. By adopting the method of buffing many imperfections on the grain will disappear and the tanner will find that he is obtaining a far greater percentage of No. 1 leather than he did by leaving on the grain as nature formed it. The loss of weight by buffing would be merely nominal, while the improved feeling, quality and greater durability of the leather so treated would be of far greater consideration. To become better convinced, take one dozen sides of leather after it is stuffed, set out and dried, and then

buff off the grain. If the grain is very thin, "snuff" it, that is, split the grain, being careful not to cut through into the tanned gelatine, and black in the usual manner. By this method the blacking will take more freely and be more indelible, and to the grain side will impart a smooth, satin feeling.

After the hides are fine-haired, run them in the wash-wheel with cold water for ten minutes, and thence in the handling or coloring wheel for ten or fifteen minutes, in a pure liquor of about five degrees density. If run in this wheel too long, a prominent diamond figure will be raised and the flanks greatly broken, and when scouring, it will require extra labor in removing the figure. For harness leather tanning, the suspending of the hides in the pits should take precedence over any other method. In no other class of leather are full and fine flanks and shoulders more desirable than for harness, and in no other way can those objects be secured more successfully than by supending in the first stages, besides yielding increased gains in the weight of the leather when finished. Change the packs and liquors daily for the first few weeks and each time increase slightly the strength of the liquors and use them fairly cold. For more minute particulars of the tannery work, consult Chapter II of this series.

When the leather is fairly "struck," take the sides from the sticks and put them in the "lay-aways," and give them a good layer of ground bark with a first run liquor and let them remain for three or four weeks to fill and ripen up. When taking out to skive, rinse the sides well in a clean liquor, and when the excess of liquor has been pressed out by laying in pile, take them to the lofts for "sammieing."

SKIVING AND RE-TANNING.

The skiving is done by hand or by machine, and the flesh should be entirely removed without cutting into the blood veins, but where the joles are extremely thick, give them an extra cut to somewhat nearly conform to the body portions. Should a more attractive color be a consideration, and a basis secured to hold the black, which is quite important in hemlock tannage, then run the sides for twenty minutes in the drum-wheel. For twenty sides, put within the wheel one pail of dry American sumac and two pails of strong gambier liquor. For oak tanned leather, this work can be dispensed with and the sides taken back to the tannery and given a good liquor. Should those of hemlock tannage not be thor-

oughly tanned and well filled after coming from the wheel, take them back to the yard and put into a good first run liquor, and throw them up occasionally in pile to press and change the liquors; continue this treatment until the leather is in good condition for scouring.

SCOURING AND SAMMIEING.

For this work the scouring machine will be found preferable to hand, and untiring in its work in practically scouring a side of harness leather. First scour on the flesh side until a nap is raised, and any remaining spots of flesh removed; then turn the side grain upwards and go over that surface several times until all the old grain is distributed and a natural alignment of the side secured, and finally apply a dressing of cod and paraffine oil to the grain and hang them up to sammie. When the excess of water is fairly absorbed, take the sides down and dampen those portions which are too dry, so that the side will be uniformly dampened and in good condition to receive the grease. Care and good judgment is required for this work. If too wet, a higher temperature of grease and wheel will be required to expel the water before it can be replaced by the grease, and if stuffing by hand, the leather would not hold the "set" as well as when in proper condition. If too dry, the grease will strike through to the flesh side and become discolored, giving the appearance, when finished, of containing an excess of grease, when the real facts are, there was a smaller quantity in the pores and cells than would have been the case had the leather been prepared just right. There is a wide divergence of opinion in regard to the condition of the leather as to the amount of grease it will carry. Some curriers claim that over-damp leather will not carry as much grease as leather wherein the water is practically absorbed. The writer has made several experiments in this direction, and begs leave to differ with many curriers in this respect. I claim that leather uniformly damp, so that by gentle pressure on a folded portion of the side, water will ooze out from the pores, it will carry more grease and retain it, than when the leather is too dry or fails to make the above test. In making this claim, I am free to admit that the temperature of the grease and wheel should be a little higher, and the leather will require a few moments more time in the wheel to absorb the water and force the grease within the pores and cells. Further, leather so stuffed will fail to show any discoloration when dry, at the same time

containing fully one pound more of grease for an average side of harness leather than it would have done had it been stuffed comparatively dry. Similar results are obtained by oiling or greasing a pair of boots or shoes. If put on in the condition when on the feet, the oil or grease will immediately strike through the upper and lining, and the sock is at once soiled and the leather does not have that soft and pliable feeling as anticipated, and will not shed water. But had the boot or shoe been first washed with warm or tepid water and the leather fairly saturated and then the oil or grease applied and well rubbed in with the warm hand, or near a fire, the grease would have been retained within the cells, and no soiling of the sock would have ensued, and withal the leather would have been practically water-proof. A few experiments of this nature will convince the most skeptical, and when in daily application in a tannery, wherein improved weight and quality of leather are the requisites, the tanner who practices that method will have many more dollars to his bank account at the end of the year.

STUFFING.

This process will be confined to the stuffing by wheel, this being a comparatively new method of treating harness leather. But where hand-stuffing is adhered to, I would advise, before placing the sides on the table to set, to first take them to the jack machine and stone out well the coarse heads and flanks, which will greatly facilitate the work in setting, and produce finer leather when finished.

When the leather is dampened, weigh it up in batches of from 250 to 300 pounds each, according to the capacity of the stuffing wheel, and then deduct one-third of the weight, which will fairly give the weight of dry leather. For instance, should you put in the wheel 300 pounds, you would have approximately 200 pounds of dry leather, and for every 200 pounds of leather, put within the wheel a sufficient amount of grease that the leather will absorb without waste; but where heavy grease, like stearine, tallow and degras are employed, there will be little fear of getting in too much. It would be misleading to give any definite amount for each side or per 100 pounds of leather, as miscellaneous tannages require different treatment, particularly in the stuffing. To be on the safe side, increase the amount at first from two to two and one-half pounds per side over what has been applied by hand-stuffing, and

note the results. If too much, reduce the amount or increase, as the case may be, until the object is attained. The temperature of the grease and wheel should, when ready for putting in the leather, be at about 140 degrees F., and the wheel run for thirty minutes; then throw off the belt, open the door and run it again for five or ten minutes, to cool off the sides. The kinds of grease best adapted for this work, are stearine, curriers' stuffing grease, cake tallow and English degras, but only some ten to fifteen per cent of degras. No oils of any nature should be used in the stuffing wheel. This is one great advantage in wheel-stuffing, over that of hand; when the grease is spread upon the side, the tallow must be greatly reduced with oils to apply it, or in fact, for the leather to absorb it while hanging in the lofts at seventy or more degrees temperature. But where a temperature of 140 degrees is applied, the heaviest greases can be employed and properly forced within the pores and cells of the leather, and there remain imbedded until the leather is fairly worn out in doing service. This is the true principle for stuffing harness leather, for what other makes of leather are there that are so exposed to the inclemency of the weather, heat, cold, rain and sunshine? The stuffing of harness leather by wheel is more generally done by hemlock tanners, but when buyers and consumers of harness leather fully appreciate the increased value of leather so stuffed, the supple and water-proof qualities, harness leather tanners will be forced to abolish the olden time method of hand-stuffing.

Take, for instance, many of the finest sets of harness made from oak or hemlock tanned leather and those stuffed by hand, and let them be exposed for a few hours in rain or snow, the next day when dry they will be hard and kinky. To bring them to their former condition, neats-foot or castor oil is applied; then a solution of castile soap. Had the leather been stuffed with heavy grease in the wheel, all that it would absorb, the harness made therefrom would have withstood the storms for weeks without affecting its suppleness or lustre. It is like paint to wood; the lead and oil fill the pores, and when once removed and exposed to storms and sunshine, it commences to decay. The same principle will hold good when applied to buffing off the grain of harness leather, or in dressing lumber on the surface; water will not penetrate as readily, particularly where there is a repellant within the pores and cells. Take the buffings from the grain of leather, and with slight strain,

hold it to the naked eye, and you will readily discover innumerable pores, while on the grain surface, from that which it was removed, it is, to all appearances, compact and smooth as glass. When this grain or buffing is left on the leather, it is but natural that those millions of small pores would act as pockets between the cuticle and corium of the hide, thereby having a tendency to retain the moisture and eventually destroy the life of the leather.

SETTING.

Where the setting machine is at hand, it will be found very desirable for working out the grain to produce a smooth surface and firm leather; for wherein heavy leather, like harness, is run in the stuffing-wheel, there will be a prominent figure raised in the grain similar to that produced by cork-boarding. This has been one great objection to wheel-stuffing harness leather; further, the leather would not hold the "set" as firmly as when it was hand-stuffed. This was largely due to improperly dampening before going into the wheel, but this defect has been greatly overcome when the stuffers and setters became more familiar with the work. Set the sides firmly on flesh and grain, and then give a light dressing of oil on the grain side; then suspend the sides from tail to head on racks to dry. Let them dry slowly without exposure to strong draft of air or light. When partially dry, should the old grain not be thoroughly put out, take down the sides and by jack or setting machine, give them a good stoning on the grain side, which will effectually remove all traces of old grain and give to the leather a firm, yet mellow feeling. Hang up again until thoroughly dry.

FINISHING.

Should experiments in buffing off the grain be made, this will be the first operation, after having slicked over the flesh side with a fairly sharp steel slicker. The buffing may be done the same as for oil shoe grain or machine-sewed welt, and as previously mentioned; should the leather be of thin grain, caused by high liming and too low bating, then merely split the cuticle, but where the hides are prepared by the sulphide of sodium process in the beam-house, and then suspended on sticks in the tannery pits, a heavier buffing may be taken off and a fine and perfectly smooth foundation will be secured on which to finish.

BLACKING.

The mordant composed of chipped logwood and sal-soda, is pre-

pared in the usual way. Many curriers still adhere to the use of urine to draw the color and strength from the logwood, and to assist in neutralizing the grease on the grain surface, so as ro produce an indelible black.

Sal-soda is now more extensively used for that work, and is much cleaner, and, as a rule, more effective. But care should be given in using either soda or urine of too great strength, else when the leather is dry a white scum will appear on the grain surface, which will be found very difficult to remove. The operatives doing this work should be frequently cautioned in this respect, for should the leather fail to take the sig readily, an extra lump of soda is put into the logwood to facilitate the work, and to save elbow labor. The great secret of obtaining a good black, is to have the grain properly prepared with the sig before the blacking is put on. Wherein the grain is buffed off, comparatively little labor will be required in the blacking, but when on it must be fully saturated with sig and well rubbed in, until the grain is mellow and uniformly damp; then apply the blacking with a horse-hair brush, which will take effect instantaneously and with little labor.

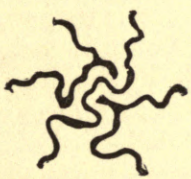
When blacked, give to the grain a dressing of hot tallow, and hang up to dry. When fully dry, place each side on a clean and smooth faced table and go over the grain with a glass tool until the surface has a smooth, glass-like appearance, and should the tallowed surface fail to be uniformly distributed by the glassing, take a woolen rag and work the tallow into the pores ; this will also produce a rich lustre to the black. Trim off all ragged portions and assort for the several classifications.

HARNESS MORDANTS.

For the mordant use about one pound of sal-soda to one bushel of chipped logwood. Place the ingredients in a coarse sack, and with a stout cord attached to the neck, suspend the sack over the barrel by a pulley connected with the floor timbers above. Take an ordinary barrel of about fifty gallons, and fill nearly full with soft water, condensed steam preferred, and by direct steam connection force the steam into the barrel until near a boiling heat. Raise and lower the sack at intervals in the barrel, and apply the mordant hot to the grain with a stiff bristle brush. When the color of the logwood is well absorbed throw it away, and refill the sack as before.

BLACKING.

The same recipe as given for boot grain and oil shoe grain blacking makes an excellent harness black, it being clean, cheap and durable, and is made as follows: Take nine pounds of copperas, one-fourth pound of epsom salts, six ounces of ascetic acid, and one ounce of nut-galls. Mix and dissolve by steam pipe in a pail of soft water. Turn into a barrel prepared for that purpose, then add sufficient soft water to make in all forty gallons. It is ready for immediate use at a cost of one cent per gallon.



CHAPTER XIV.

OAK AND HEMLOCK BARK EXTRACTS.

An English correspondent to a London trade paper—*Leather*—says: "As the population of different countries increases and their numerous wants become more varied, the employment of prepared skins is developed, perhaps more largely than any other branch of industry. As a necessary result, the materials for working, and especially for tanning hides and skins of various kinds, are more and more sought after. No states in the Old World, or very few, can supply from their own soil the material required. Hence, these have to be sought for afar off and chiefly in tropical regions, where nature furnishes them in abundance."

What other country than America can furnish in greater abundance and at comparatively small cost oak and hemlock bark extracts? Sumac, canaigre root and numerous other vegetable tanning agents can also be raised and converted into extracts to meet present and prospective demands, not only of the tanners of this country, but those of the Old World. Oak and hemlock extracts, two popular tanning agents, have been in steady, increasing demand for export to England and the continent, and are destined to further displace the use of the more expensive tanning materials of those countries.

Much has been said of late in relation to bark extracts, and not for years have the American tanners taken such an interest in their tanning materials as at the present time. Frequent inquiries are being made in relation to the cost of extracts in comparison with the crude bark, and the advantages to be derived through their use. In a general way I will endeavor to show cause why the tanners should more generally introduce extracts into their tanneries as a substitute, wholly or in part, with ground bark. The barks of our forests will not last forever, especially when such great waste is allowed as at the present time. It is claimed, and justly so, that the average tanners do not obtain more than sixty-five to seventy per cent of the tannic acid from their bark with the present system of grinding and leaching. This showing, after the bark

has been transported for hundreds of miles and at an expense in freight rates equal to the first cost of the bark, is not of itself creditable to the intelligence and usual economy practiced by the tanners of this country.

This fact has been presented to the tanners so plainly and forcibly through chemical analysis of the so-called spent bark, and the greatly increased percentage of tannic acid obtained from a given number of cords of bark by extract manufacturers, that the tanners are fast opening their eyes to the fact there has been great waste going on for years by the use of crude bark, even with the aid of the more approved appliances for grinding and leaching. This loss in itself is in reality no fault of the tanners, as it is almost an impossibility for them to exhaust all of the tannin from the bark, more particularly in sole leather tanneries wherein the pit capacity is charged with liquors of a higher density. In upper leather tanneries, where a lower degree of liquors are desirable for the green stock, the running over of the exhausted liquors on new or partially spent leaches will naturally extract a larger proportion of the tannic acid than would a twenty-five degree liquor in a sole leather tannery.

In either case the tanner is obliged to use an unnecessary amount of water in flooding his leaches, to rinse out the tannic acid held in solution before pitching. Herein is where the extract manufacturer has a decided advantage over the tanner; not that he can dispense with a less quantity of water in the leaching of his bark, on the contrary, but he has at his command, and at great cost, all the modern appliances for grinding, leaching and concentrating the large volume of liquid into a small compass. To do this successfully requires immense outlays in boiler and pumping capacity, copper vacuum pans, etc. In place of boiling up the leaches in the several runs, and running off the liquors directly into the pits, the extract makers run them into their condensing pans, where the excess of water is exhausted, and the product becomes of about the consistency of tar or molasses. The process of concentrating being performed in vacuum pans of copper, there is no waste of the tannic acid, as when boiled down in the open air, where a large portion of the astringent properties pass off in vapor, leaving a residue indicating great density, but found wanting as a pure tanning agent.

Let us go back fifty years, for instance, when many New England

tanneries were without cover from protection of the inclemencies of the weather ; when the bark was crushed by the mill-stone and the old iron bark mill operated by horse power, grinding one cord of bark daily. Then and for several years afterward, but few tanners had steam boilers or engines. The hides were soaked, limed and bated the same as now, but with cold water and liquors. There was no leaching of the bark for the reason they had not the leaches or steam, with but few exceptions ; the pits were built the same, but without log conveyors at top and bottom to change the liquors ; no junk, no pumps, in fact, everything was done in a very crude way. Still later some one or more tanners, with more enterprise and capital, built steam mills for grinding the bark and milling the hides, and many small tanners went to them to have their bark ground and hides milled, paying one dollar a cord for the former, and five cents a hide for the latter work. Each tanner was allowed a bin, having a tub within for hot water, which was thrown upon the bark after being ground, and which swelled the fibre and opened up the cells. This was considered a great improvement in those days, and tanners began to believe a new era had dawned upon the tanning industry. The hides were handled a few days in old liquors from which a pack of leather had been taken out, after being interred for months. The spent-bark was skimmed out of the pit and then spread upon the green hides, and the packs thus laid away remained until the grain was fairly colored, when the hides were given the first layer of fresh ground bark. After receiving three layers and increasing the quantity of bark each time, and reposing from one month to two and three respectively, the leather, or partially tanned hides were then taken out, rinsed and hardened and then taken to the currying shop for skiving and splitting. The split leather was then taken back to the open yard again and given another layer of bark, and when tanned was taken again to the shop for finishing.

How many tanners are there who would want to go back to those days, and endeavor to make a competence in the leather manufacture? Yet, at that time, and nearly down to the present, there has been a decided opposition to any changes from old-time methods in tanning materials and machinery. There are those now engaged, particularly in the Eastern states, who will readily recognize the crude portraying of the tanneries which were formerly in the great tanning centers of the New England states.

And, what is stranger still, there are several of those old tan-yards, as we used to call them, in existence today, and tanners could be counted by the scores who have lost their all in the endeavor to make leather on olden-time principles in competition with those who are employing all the most approved appliances, and are ever watchful for an opportunity whereby they may lessen the cost, and at the same time produce a higher grade of leather than formerly.

The future of the leather manufacture is destined to witness more important changes than has characterized it during the last half century. Those now coming on the stage will look back into the past and say: "What old fogies our fathers and grandfathers were!" Science and chemistry will have much to do with the changes in prospective, and many new tanning agents will undoubtedly be introduced to the trade. When bark extracts were first put on the market, the quality was greatly inferior to those now made, and this was one of the prime causes which induced the tanners to make such a decided opposition to their use as a substitute for crude bark. In this they were partially correct; in the earlier days of bark extracts the writer had considerable experience with them for sole and upper leather tanning. Even then, with those objections to encounter, it was found to be a valuable assistant in that of securing increased gains at about the same cost of bark, and with great saving in time. Then hemlock bark extract sold at from five to five and one-half cents per pound, and of greatly inferior quality to that which is now being sold at two and one-quarter and two and one-half cents. Then the tanner was looked upon with suspicion who adopted any of "the new-fangled ideas;" the same when attaching power to a splitting machine, setting up a pebbling or polishing machine, wash or stuffing wheel. It was good as a circus to watch the expressions of a quartette of conservative old tanners when they assembled to witness the results of their more enterprising neighbor's "folly."

There are those who are ever ready to take the lead, venture on an uncertainty with an inward conviction there will be no great loss without some small gain. Were it otherwise, the tanners would be groping in the dark today. And yet most of the improved appliances for making leather have had their existence within the past twenty-five years. In the tanning materials, there has been comparatively little change, except in the manner of applying them. Gambier has been used for many years in connection

with bark, and quite extensively so at the East, where a higher range in bark values exists than in the western states; but since the dongola tannages sprang into existence, this agent has been in active demand at greatly increased cost, but when used wholly for either sole or upper leather tannage, it has not proved a success. Canaigre root, grown similar to potatoes in Mexico, Texas and Nebraska, is receiving some attention from tanners, it being a very astringent tanning agent. Extracts of oak and hemlock bark have had an unprecedented demand the past two years. Tanners who formerly protested against using extracts, are now pretty liberal patrons, and having become familiar with their use and the advantages derived, could not easily be induced to go back to crude bark wholly or in part. It is so handy to have extracts in the tannery at all times, particularly during warm weather, when the liquors are more rapidly exhausted. Tanners are forced to acknowledge that the standard extracts of the present manufacture are far different from those made twenty years ago. There is opposition to be found, however, among many, through ignorance or from a determination to see no good in anything other than that which was handed down to them by their predecessors. Still, it is only a question of time when those now in the field will take a retrospective view and picture in imagination the old bark stacks, piled heavenward at great expense and requiring a greater area for the storage than that of the tannery and outbuildings, the waste of tannin through exposure, and loss of interest money in the carrying of stocks from one peeling to another.

By the use of extracts no great storage capacity is required. Car lots can be purchased from week to week or from month to month, as needed. There is no waste, fermentation or decay in the carrying. Should the liquors become greatly reduced the tanner will have at hand the concentrated essence of bark, to use at a moment's notice, thus preventing the hide from falling away for the want of sufficient nourishment. Should any breaks occur in the grinding and leaching system, you have in stock a friend in need.

Science and chemistry have exploded many foolish theories in and out of the leather manufacture; in the latter, tanners are now enabled to secure extracts of a high standard, made under the direction of practical chemists, and with the aid of the most approved appliances in machinery for preparing the bark and concen-

LIBRARY OF THE UNIVERSITY OF CALIFORNIA

trating the liquors, and extracts of a high grade and weighing ten pounds to the gallon are produced, having a density of 40° per "Twaddle's hydrometer," which is considered as authority in ascertaining the gravity or density of water, bark extracts, etc. Tanners, as a rule, place too much reliance on the barkometer to test the actual strength of their liquors. When they become sour through decomposition of the tannic acid, a gallic acid is produced which indicates density ; the same wherein sulphuric acid is used, the liquors show great density by barkometer test, while it is lacking in the real tannin properties. For instance, take a yard highly charged with sulphuric and gallic acids, the barkometer may indicate twenty-five density, but when sweet and pure would not indicate much over fifteen degrees. Consequently it is quite important that some uniform method be adopted by tanners and extract manufacturers to test the actual tanning properties of their liquors. The great trouble with tanners using crude bark exclusively is, they are obliged to use such quantities of water to exhaust the tannin from the bark, and their yards become flooded with weak and sour liquors. By the use of extracts these objections are greatly overcome.

From several experiments made by prominent extract makers the following showing is made relative to the volume and value of same extract of different density and weight : Based on ten pounds per gallon as standard weight ; density, forty degrees Twaddle, or two hundred degrees barkometer, being worth two and one-half cents per pound at place manufactured ; also two and three-quarter cents per pound at place manufactured ; the bark ometer measurement being of a liquor composed of one volume of extract mixed with nine volumes of distilled water. All measurements and weights being at sixty and sixty-two degrees Fahrenheit—distilled water weighing eight and one-third pounds to the gallon.

Example.—If a ten-pound extract is worth two and one-half cents, then a nine-pound extract is worth $1\frac{1111}{10000}$ cents per pound ; four hundred gallons of ten-pound extract has same amount of tannin as one thousand gallons of nine-pound extract. The density of a ten pound extract is forty degrees, per Twaddle's hydrometer. The density of a nine-pound extract is sixteen degrees, per Twaddle's hydrometer. The density of a ten-pound extract, with nine parts of water added, is twenty degrees per barkometer. The density

of a nine-pound extract, with nine parts of water added, is eight degrees per barkometer. The relative value may be continued until reaching eleven and one-half pounds per gallon, which would be worth $4\frac{543}{1000}$ cents per pound.

Plump and weighty sole leather cannot be made except through the use of very astringent liquors, and in no way can those liquors be secured except in doubling and tripling in the leaching of the bark, and then at great expense, both in labor and loss of tannic acid, as the excess of water required to leach the bark must be contracted to obtain the required density, and to accomplish this in open air, a high degree of heat is applied. This method is old, yet it is neither economical nor practical.

The most successful sole leather tanners are those who do not absorb the full strength of their bark. They claim to receive better gains and better quality of leather, from the fact they do not require as much water to absorb the tannin, consequently maintain their liquors to a higher density. This may seem to the uninitiated, or those tanners who are making upper, or grain leather a specialty, a broad statement to make, as those tanners can use their bark more economically, from the fact they do not require like strength of liquors, and can flood their bark more frequently. A third degree liquor, barkometer test, can be used to advantage in an upper leather tannery, while a liquor much under twenty degrees would be considered too weak for a sole leather tanner, resulting in loss of weight and plumpness of the stock so produced. In either case, it is not advisable nor economical for a tanner using crude bark to greatly reduce his liquors, by continual flooding and boiling up the bark, as the gum, resin and foreign matter are extracted and carried through the liquors and into the pores and cells of the hides, thereby retarding, rather than facilitating, the tanning process, besides producing a crust and bloom on the grain of the leather which tends to greatly discolor it.

If the tanner can produce better leather, and more of it, by not fully absorbing all the tannin from the bark, it does not prove that he should waste the crude material when he can buy extracts at the same, or comparatively less prices, and secure greater gains and as good leather, to say the least. Hemlock bark contains from seven to eight per cent of tannic acid. Taking the medium, say seven and one-half per cent, as an illustration, we have from a cord of bark—2,200 pounds—165 pounds of tannic acid, provided it is

all extracted, but the average tanner does not get more than sixty to seventy-five per cent by the usual method of grinding and leaching, where the extract maker gets it all, or within a fraction, by the use of the most approved appliances in bark crushers and pumping capacity. Not as high a degree of heat is required in the leaching of bark when crushed, and extracts of greater density and purity are obtained.

Harness, belting, and union sole leather, are the medium tannages, and will consume one-third their weight of tannic acid; therefore the tannic acid from one cord of bark, 165 pounds, should give a total weight of 495 pounds of leather. Plump acid sole leather, made from Buenos Ayres hides, will consume about half its weight of tannic acid. Bark extracts are said to contain from twenty-five to thirty per cent of tannic acid, on a basis of ten pounds to the gallon. Consequently it will be seen that it is much cheaper to transport extract from the bark-producing regions, where it is made, than to pay excessive freight charges on bark in bulk, and then lose from twenty-five to forty per cent of the tannic acid, as has been repeatedly demonstrated by chemical analysis of many tanners' spent (?) bark.

It is claimed that five barrels of extract of the standard grade, ten pounds to the gallon, will tan one hundred sides of medium weight rough or sole leather; also that a car-load of extract, containing 40,000 pounds, has 13,333 pounds of pure tannic acid. Crude bark, by the old method of leaching, produces four and one-half per cent of tannic acid from a cord of 2,200 pounds of bark, say one hundred pounds of tannic acid to the cord, or, in other words, there is more tannic acid in one car of 40,000 pounds of extract than there is in 130 cords, or eight or ten car-loads of bark.

One serious drawback to the more general introduction of bark extracts has been that tanners' first experiments have almost invariably resulted in using them of too great strength in the first stages. It is claimed by the makers that a ten-degree extract liquor contains more tannic acid than a fifteen-degree bark liquor. The writer is prepared to vouch for the above statement, he having had similar experience, and when becoming convinced that a barrel of extract contained the tannic acid of one and one-half to two cords of bark he began to reduce the quantity, and when the medium point was reached the results were very gratifying.

Should the tanners of this country show the same interest as have their foreign competitors in their tanning materials they would have ere this more generally adopted the use of bark extracts, or at least proven by repeated experiments the comparative cost and final results. The advantages to be derived by the use of extracts are numerous, particularly when contemplating building a new tannery. In the first place the immense stacks of bark sufficient for the season's use need not be piled up, covering more space usually than does the entire tannery plant, to say nothing about the waste by exposure, evaporation of the tannin and loss of interest money. Again, there will not be required bark mills, conveyors or leaches, which are no small items of expense in the construction, setting up and keeping in repairs. No dust in and about the tannery and less danger from fire from friction. Extracts may be received daily or weekly at the tannery, as is flour, molasses or sugar in packages at the bakeries. For storing and reducing the extracts for use it is advisable to have this building separate from the tannery and at a slight elevation, wherein are set up large shallow tanks having liquor log connections leading to the tannery pits. Into these tanks are pumped the water or exhaust liquors, and heated at a temperature not to exceed ninety degrees Fahr. in winter, when the extract is run in, and then thoroughly agitated. In the center of the tank set an upright shaft with pinion gear attachments to countershaft overhead to operate at the will of the attendant. At the bottom attach buckets or paddles nearly the diameter of the tank, so that during the process of mixing and running off into the pits a constant agitation of the liquor may be had. This will also accelerate the cooling off of liquors before running them into the pits for use. In summer a lower temperature may be applied, say sixty-five to seventy degrees Fahr., but care should be taken not to run the extracts into cold water or liquors under sixty-five degrees Fahr. when wishing to produce a perfect unity of the liquids with the extract.

If contemplating the manufacture of union tanned sole leather, oak extract should be first used on the green hides, or until such time as the complexion of the grain is well established. First impressions are the more lasting, and at a later stage when the hemlock is introduced it will be difficult to displace the original color of the oak to that of brown through the application of hemlock. During the subsequent stages in the tanning, oak extracts are

united with the hemlock, so that in the aggregate some thirty per cent of oak and seventy per cent of hemlock are employed to produce a union tannage, which is far superior to either oak or hemlock when used singly.

Harness and upper leather may be treated in the same manner in the first stages and suspended in the pits, and allowing ample space to insert a plunger, so that frequent agitation of the liquor, may be had. If bark is used in connection with extracts, it is advisable to run the reduced extract liquid into a leach of ground bark before running into the pits, for by this process liquors of greater purity can be obtained, as the "reds," or anhydrides, which appear to be sediment, and which chemists claim to contain over ninety per cent of tannin, are better utilized, they being soluble only at a temperature of 110-120 degrees F., and while it is not practical to steam up the tank to that temperature for dissolving the extract, this may be done with safety in a leach of spent bark in the final washing, wherein those "reds" are retained and finally dissolved at a higher temperature.

By the general introduction of extracts in the tannery and the abolishing of the bate nuisance in the beam-house, the tannery will become an institution not to be avoided by the fastidious visitor, nor the bark dust and bate stench be carried in the clothes to the families by the practical workers therein. Bark extracts for tanning and sulphide of sodium for depilating and depleting the hides, will eventually accomplish the object, and when that desired period arrives, the millennium will have surely come.

CHAPTER XV.

ABREAST WITH THE TIMES.

The tanning industry of this country has made greater strides in the manufacture of fine shoe leather the past ten years than during the present century. And what is a noteworthy fact, the most popular lines of leather for shoe purposes are now being made at places far remote from the great centers wherein the leather manufacture has been carried on for several generations.

Some forty years ago tanneries were unknown in Chicago and Milwaukee, two important tanning centers on the shores of Lake Michigan. Now the products of those two cities for the past year were $13,000,000, and a combined capital of $7,000,000 is invested in the business, which employs about 4,000 hands and consumes 75,000 cords of hemlock bark annually, independent of gambier, sumac and extracts.

The manufacture of the celebrated Chicago wax uppers and kips is comparatively of recent origin, for we need not go back over twenty-five years when the tanning industry was in its infancy, but having at its doors the best hide market in the world and unlimited supplies of bark from Michigan and Wisconsin, together with lake and rail facilities such as no other cities enjoy, it was no wonder the tanners were enabled to compete and secure a good portion of trade from boot and shoe manufacturers throughout the New England states. It is claimed, but without foundation in fact, that the Eastern tanners cannot produce the same quality of leather as that made in the West. The reasons given by those who have attempted it are, that the water and atmosphere were both unfavorable to the tanning and drying the leather. But the chief cause has been that the Eastern tanners do not give the care and attention to the numerous details as the Western tanners do. Neither do they use as good material in the finish nor put as much hand labor to the stock, it being mostly done by machinery, which has a tendency to harden the leather. In justice to the Eastern tanners, it may be said they are more practical and economical, but too much on the penny wise and pound foolish order, the business, in many instances, having passed from sire to son, the members serving a long apprenticeship in the calling.

Still they continue to plod on in the same old beaten path their fathers and grandfathers did before them. Those tanners who have come upon the stage at a much later period, and not a few were they who had no practical knowledge of the business, have been

successful. They had the snap, energy and courage, characteristics of the business men in the large Western cities. Take the Salem and Peabody tanners, for instance, with but few exceptions, outside of the morocco manufacture, their output in waxed upper, kips and splits, made principally from dry flint foreign and dry Western and Southern hides. Twenty years ago, and even at a much later period, should one of those tanners invest his money in green-cured Western hides, with a view to finishing them into wax upper leather, he would have been considered a fit subject for an insane asylum. Yet, at the same time, Chicago and Milwaukee tanners were selling their wax upper made from that class of hides, to the largest boot manufacturers in the New England states, at from three to four cents per foot in advance over what was paid for Salem and Peabody's waxed upper.

When the war closed the demand for the coarser grades of dry hide stock was greatly lessened; the old style brogans worn largely by the slaves, were substituted by fancy top calf boots or shoes. The demand for Western wax upper has also fallen off during the past five years, for the simple reason that consumers demanded a change in their footgear. Farmers, who formerly wore heavy cowhide boots of nine to ten ounce substance, and finished on grain and flesh, fell back to kip, and later to calf boots and plow shoes; while now oil grain shoes are becoming the rage.

The general tendency of consumers seems to be toward lighter footwear, and they are becoming convinced that leather properly tanned and finished of from three to four ounce substance per foot, is equally as water-proof as leather of from nine to ten ounces, finished on the grain side, and besides they are more durable. The Western tanners, always alive to their own interest, and the wants of trade, have kept abreast of the times in this particular. Whenever they see a falling off in demand of their once popular lines, they study and experiment to produce more popular styles of leather, to meet the wants of fickle humanity. It requires a good deal of courage, however, for a tanner, conducting an extensive business, to make radical changes, for before he can learn the actual results of his experiments, which requires several months' time, he has his pits filled, and, should the output fail to come up to his expectations, or those of the trade, great loss ensues. This has been the case with the manufacture of dongola kid, in the several styles of finish. Large sums have been sunk in experimenting, and those

who were fortunate and succeeded in establishing the popular brands of kid, are now reaping the benefit of their enterprise and large outlay of money. The introduction of these new styles has also resulted in greatly lessening the importation of French kids, formerly so popular with fine shoe manufacturers. It is the height of folly for tanners, or those otherwise engaged in manufacturing, to take a decided stand against making experiments, or in joining in the saying: "Let well enough alone." When, having reached that point of perfection, the often quoted saying will have a practical application, but we have not as yet reached that stratum where the minerals of the earth can be mined and converted into pure gold and silver, and if it ever is done, it will be at great expense, unless aided by scientific research. The makers of leather are destined to witness more radical changes in styles than now exist, and those of courage and enterprise will lead the van in the race for supremacy. There will always be found plenty of followers after the object has been accomplished, who are ready, by fair means or foul, to reap the benefit of their neighbor's experience.

The largest tanners in Chicago, who, but a few years since, confined their output to wax upper, have been almost exclusively engaged in making waxed calf and kip skins, their combined output being from 20,000 to 25,000 skins weekly. In many respects these skins are superior to the French, and have been the means of reducing the importations of French skins from $15,000,000 a few years ago, to about $1,000,000 at the present time. Not to be behind in the race, these tanners, and others similarly engaged, find that the more recent brands of imitation calf, made from veal kips and cowhides, as also oil shoe grains, promise to displace the use of calfskins to a greater or less extent, and have therefore turned their attention to the manufacture of these popular lines of shoe stock. To the Western tanners belong the credit of being the first to originate and perfect the tannage and finish of oil shoe grain and imitation calf, the latter better known to the trade as glove grain, but of far superior tannage, finish and wearing properties, than the original glove grain.

The Eastern tanners who have continued making the old style of wax upper and buff leather, have witnessed their trade dropping out of sight yearly, and are asking the question: "What shall we do?" To continue in the same old groove will eventually result in loss of trade and capital, which has been the bitter experience of

many tanners during the past few years. By not adopting the old truism: "Nothing ventured, nothing gained," they continue to stick to old-time principles, or close up their tanneries in disgust. Many have already been closed, and more will surely follow, unless those tanners keep abreast with the times and reach out for future trade.

SOMETHING ABOUT WARBLES.

There are 320,000 species of insects in the world, says the *Scottish Leather Trader*, and the individuals belonging to each species are as the sand upon the sea shore, without number, so that it is not at all extraordinary that we come across a stupid insectile now and then without a grain of sense in its little noddle; but the stupidest we ever came across in all our rambles is the female ox bot, accused of laying her eggs under the skin of cattle, and producing in Britain a "warble" and in America a "grub," that makes the cattle mad and the tanner angry. The eggs are left to hatch themselves out, taking fully ten months in some countries on the job, and then the larva is supposed to push itself stern foremost through the hide, jump to the ground, and hide itself in the earth for a few months more before it begins to torment perhaps the very ox that carried its nest.

This is the lady—this is the "She who must be a jade," the little fly with brown wings, white face, black thorax, black band around her yellow middle, and black legs and red feet, that torments the ox and the cow in the month of June, laying eggs with her patent four-tube retractile ovipositor—Miss Ormerod says below the skin, to eat their way out; Sir John Lubbock says among the hair, to eat their way in; and White, of Selborne, says perhaps she deposits her eggs both inside and outside. White is quite right; perhaps she does; at all events, this is a picture of the insignificant *hypoderma bovis* that spoils hides every year to the full value of two million pounds sterling. At least this is the dipteral smoothbore that gets all the blame.

We have a theory of our own about the warbles, and believe the beautiful little fly presented above is entirely innocent. We believe the warbles are the product of parasite life, the result of fermentation in the blood, developing minute organisms that struggle into existence and shape. But every living thing proceeds from a pre-existing parent! Well, we don't say no, and yet we do not believe that the *oestrus bovis* is the parent of the warble; neither

can we tell whether the egg or the fly came first in the order of existence. The so-called warble is neither larva nor chrysalis. It is a perfect animal in itself; it breathes, it moves, it eats, it digests, it multiplies; but it must be nameless until science discovers its proper title. A warble is a small, hard tumor on the back of horses, caused by the heat of the saddle, or a small tumor on the bodies of catttle caused by supposed larva, so that we have hitherto called this thing after its house.

This is the so-called warble—two portraits of it—and no one ever saw it take off its gummy coat and put on wings. Miss Ormerod says she pressed out of their snug little holes nine "maggots." They were from three-quarters inch to one inch long, from two-fifths inch to a little more than one-half inch in width, and were slightly less in depth. They were of an oval shape, and blunter at the mouth end than the other, and varied in color from pale yellow to black. They kept up a regular contraction and expansion as they lay on the table, and moved their mouth end from side to side in all directions. The breathing spiracles at the hole of the warble were noticeable as two black spots. Their bodies had from nine to ten rings going right round about them. The skin was of a tough, leathery, elastic character, and had a number of patches of minute prickles on it. The under surface of the body was slightly flattened, and the skin had a wrinkled appearance. "I put these maggots in some soil in a pot, covering them to the depth of one inch, stretching some muslin over the top. The next day they had wriggled their way to the surface of the soil. Some of them died, but by keeping the soil moist the remainder kept alive. In a few days their skins became quite hard and stiff, and turned quiet black in color. All of them afterwards died and moulded except one, which I opened on June 19th, and found it partly filled with a clear liquid. In this liquid was a whitish semi-solid substance in the shape of an insect. The top of the chrysalis came off like a lid."

Just so, Miss Ormerod! In trying to raise a fly you destroyed a flower perhaps, and we wager you a diamond necklace that you cannot produce to us a full perfect bot in good working order that you have brought up from a maggot that has been taken out, or has jumped out of the skin of an ox or cow.

Whenever cattle are deprived of green food their blood ferments and germinates a kind of infusoria that find themselves living in solid fat, soon put on a definite form, and strive to participate in the good things of this earth. Notice that on cattle living between the parallel lines of latitude forty and sixty north and south "warbles" are active from November to April, between thirty and forty they come in December and leave in February; and twenty degrees on each side of the equator, where we have perpetual summer, and green grass all the year round, they never make their appearance at all.

In the August number of the *Leather Trader* we gave a very interesting letter about this matter from "J. B.," a gentleman we know that ought to be well acquainted with the subject, for he sees them every day almost, and he wisely suggests that tobacco juice would kill the germs and decrease the number of skirmishers next season. This is very good. If it is a fly we are fighting, the tobacco would certainly stifle the young rogue, and prevent any mischief from him; but if it is a disease, a course of medicine between seasons is the only and the proper remedy. Even if you suffocate your maggot the hole is still there, and the tanner is no better off, but medicine will prevent even the hole in the hide.

IMITATION OF KANGAROO.

The imitation of kangaroo kid made from horsehides and calfskins, is destined to greatly displace the use of the genuine kangaroo skin on account of the scarcity and high prices demanded for this class of stock. It was the same with goatskins before imitation goat, as made from cowhides, was very generally introduced as a substitute. Or even later, when cowhides were utilized in making what is now known as imitation calf or glove grain. The skin of the kangaroo has the toughest fiber, considering its substance, of any of the animal species yet introduced for fine shoe leather. It is also very pliant and durable, but the high ruling price, 40 cents per foot for the choice grades, has prevented others than custom shoemakers from employing it. Consequently, owing to the great

popularity of this stock, there has been much experimenting with goat, calf and horsehides in the endeavor to produce a substitute for the kangaroo, but only in the two latter classes of skins have the experiments made been fairly successful. The natural figure of the goat has been the chief obstacle in the way of imitating the kangaroo. Very good imitations have been made from horsehides after the butt, or shell portion, has been cut off for cordovan purposes. This makes a very tough and elastic leather which favorably compares with the kangaroo, but the extremely thin flanks and shoulders are objectionable, although this product can be made at about one-third the cost of the genuine kangaroo. The low ruling prices of green-cured calfskins have attracted the attention of tanners, or more properly, morocco manufacturers, to these as a substitute for kangaroo, and some very creditable stock has been put on the maket and the comparatively low prices at which it is sold, say from twelve to seventeen cents per foot, it will, without doubt, be quite extensively used by large manufacturers of fine shoes, and sold as kangaroo calf leather. For this work the lighter skins are used, such as "deacons," and spready calf, which range in prices from thirty to forty cents per skin. One great advantage in employing calfskins for this work is that they are practically free from scratches or abrasions of any sort, and when scientifically taken off the animal every portion of the skin can be utilized in the cutting of shoe vamps and toppings, and at prices commensurate with that of oil shoe grains, imitation goat, and calf, as made from cowhides.

The tannage and finish of kangaroo calf leather is supposed to be a trade secret, but does not differ materially from the dongola kid tannage and finish, or that employed in the genuine kangaroo leather. The skins are worked in the beam-house in the usual manner, but I would advise using the sulphide of sodium process to that of lime and chicken manure, as plumper flanks, a thicker grain, and a more compact fiber can be produced, which will greatly aid in securing the desired break or fine figure, characteristic of the genuine kangaroo when finished. The principal tanning agent is gambier, which imparts the desired color and toughness of fiber, but to combine with those a close grain and fine flanks, I would advise using one part of hemlock bark liquor to two parts of gambier. Bark extracts may be substituted for crude bark, with equally good results, during the first stages, but not of too great

density until the skins are fairly "struck." I would also advise suspending the skins in the pits by connecting the tail and two hind shanks to sticks. Then hang them in the pits head and shoulders downwards, with a bountiful supply of liquor over the sticks. By this method, the shoulders and flanks will be fuller and finer, and will greatly lessen the time in tanning. Change the liquors and skins frequently, and in two weeks' time they should be in good condition to shave, and where the thick joles have been taken off in the beam-house the skins need not go back to the tannery after shaving. Should any of the skins be too plump on the kidney portion, after shaving, run them through the machine and take off a skiff, so that the entire skin may be fairly uniform in substance.

RE-TANNING AND SCOURING.

For re-tanning put into the drum-wheel, similar to the stuffing-wheel, seventy-five skins and three pails full of strong gambier liquor, and three-fourths pail of dry American sumac, together with what warm water will be necessary to fully saturate the sumac and skins, and run the wheel for half an hour. Pack them in pile for twenty-four hours before scouring. Scour by hand, or machine, with stone tool and from out a bath of clear warm water, and on the grain side only. Remove all traces of the old grain, wash off and go over with the steel slicker, then oil lightly on the grain with cod and paraffine oil, equal parts, and hang them up to "sammie."

STUFFING.

When preparing the skins for stuffing see that they are uniformly dampened so that water, by a gentle pressure, will ooze from the pores, and let them lay in a snug pile for twenty-four hours before stuffing, when the skins will have become ripe and in good condition to receive the grease. For this style of finish it is not advisable to produce the same luster that is given to dongola kid or imitation goat. It is what is called a "half bright" or a lusterless finish, as desired, but should a high finish, such as produced by the polishing jack, be required, the stuffing-in wheel would have to be abolished and only oils used in the setting, as with imitation goat or kid stock. But a more desirable quality of kangaroo calf leather can be produced by stuffing the skins with heavy greases, which will also make them practically water-proof and obviate the "piping" up of the grain when finished.

When the skins are in the sammied condition, weigh them up into batches of 300 pounds each, providing the stuffing wheel is of sufficient capacity for that amount, and for every 100 pounds of so prepared leather put into the wheel fifty pounds of grease of the following nature and proportions: Take currier's stuffing grease —that made from tanner's waste, or in lieu thereof tallow stearine —seventy per cent, and English degras, thirty per cent. Mix in a steam jacket kettle and heat to a temperature of 140 degrees F., also the wheel to about the same temperature, and when the condensed steam is drawn off from the wheel, put therein the batch of skins—300 pounds—and 150 pounds of the combined greases, and run the wheel for thirty minutes. Then throw off the belt and open the door and run again for a few moments to cool off the skins.

Much depends on the preparation of the skins in the beamhouse and the nature of the tannage as to the amount of grease required in stuffing. Therefore I would advise making some experiments and note the results before stuffing a large number. It is not advisable to stuff them too heavy for this work, as it will be necessary to give them a dressing of oil in the finishing. The amount of grease given above should be readily absorbed during the process, and should they be "hungry" or not fairly filled in pores and cells, increase the amount of greases so that when set out and dried the skins will have a rich and cheesy feeling without being discolored.

SETTING AND DRYING.

When the skins are fairly cool set them firmly on the grain side with stone and slicker. This is important work. If done by hand the skin should be first placed on the table, butt to the right and the back strip running along the front edge of the table or only one-half of the skin upon the table at a time, and when that portion is thoroughly set in body and flanks reverse the skin by bringing the butt to the left and complete the setting. Then hang up on the racks from the two hind shanks to dry. Dry slowly in a dark room at a temperature not exceeding seventy degrees Fahr.

FINISHING.

The first operation will be the blacking of the skins after having been well dried out after the setting. The sig or logwood is prepared in the usual way for most grain blacking. The blacking

is made as follows: Take nine pounds of copperas, one-fourth pound of epsom salts, six ounces of ascetic acid and one ounce of nutgalls. Mix and thoroughly dissolve with steam pipes in a pail of hot water. Put into a barrel and add forty gallons of soft water, condensed steam preferred, and it is ready for immediate use. When blacked, hang up the skins for a few moments to temper, then take them to the glassing table and give them a good, firm glassing until the fiber and tanned gelatine is well cemented together, then hang the skins up to dry. When fully dry trim off all ragged edges. The skins at this stage will be naturally firm and will have to be submitted to either the staking process or of soft boarding. A machine has been recently invented called the Barker staking and pert-hing machine, which, it is claimed, is superior to hand work for softening all kinds of leather. When the skins have been relieved of their tinny feeling through any of the above agents it will be necessary to give them their final dressing, viz., blacking and beef blood. The former is made as follows: Take eight ounces of extract of logwood, one ounce of bichromate of potassia and two ounces of prussiate of potassia. Dissolve in eight quarts of soft water and when cool mix with beef blood in such proportions as to produce the desired brightness of finish. If not too bright take, say, two parts of the dressing to one of blood and mix thoroughly. Then apply to the grain of the skins with a soft sponge, rubbing it well into the pores. Should a lusterless or higher finish be desired it may be had by either reducing or increasing the amount of the beef blood. Hang up to dry and afterwards give the skins a fair dressing of cod and paraffine oil of equal parts, upon the black side, and pack them black to black until the skins have absorbed the oil, when they are ready for the assorting and classifying.

SKINNING AND CURING VEAL SKINS.

BY CARROLL S. PAGE, HYDE PARK, VT.

"A Few Minutes' Talk With Butchers Upon the Subject of Taking Off and Curing Vealskins" is the title of a very instructive and interesting little book that is being sent freely to all who desire it by Mr. Carroll S. Page, the well-known calfskin dealer. Mr. Page has a pleasant way of giving advice that appeals directly to all sensible men. Butchers in the country, through ignorance or carelessness, frequently rob themselves by the manner in which

they damage the hides and skins they take off. It is just as easy to take a skin off well as it is to cut and score it. Many butchers do not know how to skin a calf scientifically, although this is not difficult when properly explained. We have pleasure in printing Mr. Page's remarks and heartily recommending all interested to secure for themselves a copy of this valuable little book, which reads as follows:

PAGE'S METHOD OF TAKING OFF AND CURING VEALSKINS.

1. STICKING.—The chief end in view in sticking a calf is, first, to so cut the jugular veins that the animal will be well bled. This should be well done, not only because the carcass or meat will be thereby made of more value, but because if not properly done the blood may cause a discoloration of the skin.

Secondly, the knife should be so handled that the incision in the skin be lengthwise rather than crosswise of the throat. The cheek of the skin is of some value if the throat is not cut crosswise, but if the crosscut on either side of the lengthwise rip extends an inch into the skin it renders the cheek valueless except for glue stock. A butcher who thoroughly understands the anatomy of the animal will stick the calf by inserting the knife near the brisket and with one thrust sever the jugular veins, which cross each other at this point. A less expert butcher will, doubtless, find it the better way to make a slit lengthwise of the throat eight or ten inches long, then skin the throat a little on each side of the slit so that the edge of the skin may with the fingers be held away from the neck while the throat is cut in the ordinary manner.

After the calf has been strung up, many good butchers stroke down the sides of the calf so that the blood, which otherwise might settle under the membrane of the skin and give it a reddish or blood-stained appearance may be carried off through the veins. This takes but a moment and gives the skin a clear, clean, healthy complexion, while if the blood is allowed to settle under the membrane, as it will where the calf is improperly or imperfectly bled, the salt used in curing does not penetrate the pores of the skin, as the blood thickens or dries so quickly and to such an extent that it acts as a water-proof protector through which the salt does not readily penetrate. The result is that the skin is not properly cured and if carried a few weeks in hot weather in this condition it will neither make as much nor as good leather as those which are free from blood.

2. RIPPING.—The next process is that of ripping, unless the second method named in section five of these directions is followed, in which case the ripping succeeds that particular part of the skinning process which is given in that section. Perhaps all that can be said touching this feature of the skinning process is that the slit should be made from the middle of the under jaw—being careful to run the knife exactly over the top or center of the brisket bone—in a straight line through the center of the belly, between the teats down to, and even an inch or two down upon the roots of the tail.

3. SKINNING THE LEGS.—This is a process which very few butchers comprehend the importance of. Upon it and the ripping depends the shape, or "pattern," as the shoe men term it, of the skin. A piece of calfskin is worth seventy cents per pound in its finished state, if of choice tannage and absolutely perfect. If the ripping and skinning of the legs is improperly done, the value of the finished skin may be easily lessened ten cents per pound, and the average weight is perhaps three pounds. The average loss, therefore, by reason of this defect, may be thirty cents per skin. Always bear in mind that it costs just as much to tan a disfigured, misshapen, or poor pattern skin, as it does one that is perfect; and if the skin is worth thirty cents less after it is finished by reason of disfiguration caused by improperly slitting the leg, the thirty cents damage must of necessity be the measure of difference between a good shaped and poor shaped green skin; so do not forget that it is the easiest thing in the world to lessen the value of your skin in this way by thirty cents, a loss which might be easily saved by devoting thirty seconds more time to the process of ripping the legs. The correct way is as follows:

Grasp the fore foot in the left hand, cut around the leg just above the dew-claws, take a short step back toward the tail so as to straighten the leg, and, drawing it a little away from the body, insert the knife at that point of the skin where the hoof is split, on the front or forward side of the foot. Now comes the particular part of this process, for upon the next movement of the knife depends the shape of the skin. Run the knife directly over the knee so as to split it exactly in the center, avoiding any side cuts or scallops, and extend the rip or slit to the top or center of the brisket bone. Serve the other fore leg, of course, in the same manner. Then grasp the hind foot in the left hand and cut around next to

the dew-claws. Step back towards the head and a little away from the body of the calf so as to straighten out the leg. Insert the knife in the back side of the leg between the dew-claws, and run it down on the back side directly over the gambrel. Then follow the line marked by the parting of the hair so that the slit runs where the hair parts, or where, perhaps, it may more properly be said to meet, the hair on the legs and butt growing towards the belly, and that on the belly growing towards the legs and butt. This line of demarkation can usually be seen quite plainly. If these directions are followed the knife will strike the belly about half way between the bag or teats and the root of the tail.

If these directions are carefully followed, the skin is made of good pattern, i. e., wide and uniform, without being either too narrow or too full just in front of the hind leg and just back of the fore leg, as will certainly be the case if the leg is improperly ripped. It is very easy to take a part of the skin from the flank just back of the fore leg, giving the skin a gouged-out, narrow-waisted appearance at that point, and leave it, i. e., the part that is so taken out, in front of the leg, thereby widening the neck to an abnormal width. So, too, that part of the skin which would properly be left upon the butt, may appear, when the calf is skinned, in front of the hind leg, giving it an extra fullness of flank there, or it may be so left that the butt is unusually full, and a corresponding narrowness in front of the hind leg. There is a right way and a wrong way to leave the shape of the skin, and the shape depends largely, in fact almost entirely, upon how the skin is ripped from the dew-claws to the belly. Some butchers rip the leg on the inside, thus leaving a pocket at the knee or gambrel joint. This is wrong, for the pocket cannot be finished into good leather. The leg should be so ripped that the knife splits this pocket, as it will do if the slit is made in the front leg over the knee, and in the hind leg over the gambrel. Never slit the skin on the inside of the leg.

The legs having been slit as above directed, skin enough thereof next the dew-claws so that the skin can be taken in the hand or hands, and, placing your foot upon the calf's foot, strip the leg without further use of the knife, from dew-claws to just above the knee and gambrel.

It is presumed in these directions that the butcher will be expeditious in all his movements, for while the directions will hold good in nearly every case, if the body of the calf is warm, it is

nevertheless true that as soon as it is cold it will require a much greater degree of strength to pull or fist off the skin than it will before the animal heat has partially or wholly left the carcass.

4. SKINNING THE HEAD.—We understand it is the custom of some butchers not to skin their calves' heads. Part of them omit it because they don't think it pays, when they are in a hurry, to save the skin of the head. Some wish to save the head with the skin on, and so scald it and remove the hair. Of course in such cases the head isn't skinned. We do not urge upon butchers any particular course, although we believe the value of the skin of the head is more than enough to pay for the expense of skinning, and so generally recommend that it be taken off unless the butcher is short of time. This advice, however, is given with a big if, for if the throat is cut in the least crosswise it does not pay to skin the head. It is only when the cheek can be saved, as it can be if the above directions in regard to sticking the calf are closely followed, that the skin of the head is of sufficient value to pay for skinning. If, however, the butcher decides to skin the head, this process is next in order after the legs are skinned.

Care is not as necessary in skinning the head as it is in skinning the other parts of the calf, of course. The head may be skinned with a knife in the ordinary way to a point about four to seven inches back of the ear. Slight scores with knife are allowable on the head and neck even in the best qualities of skins.

5. SKINNING THE BODY OF THE CALF.—*First Method.*—The skinning of the body is of course the feature of the calf skinning process upon which butchers most differ, and we give—out of the great variety received from butchers in answer to our $50 offer—the two methods which we think the best and most practicable.

FIRST.—The carcass having been hung up and all the preliminary work as described in the foregoing sections having been fully completed, viz: the legs partially skinned, the head skinned, the legs and body slit or ripped open, commence at the center and skin enough on the left side so that the skin can be grasped in the left hand. Then with the right hand—some prefer to first cover it with a napkin or towel—commence the fisting-off process.

If the skin separates easily from the carcass, as it usually will at most points, no instrument is necessary. If, however, it adheres too closely to the meat, take a piece of hard pine about eight inches long, and from an inch to two inches wide, with the ends

rounded in circular shape about like an ordinary table knife; and at the places where the skin adheres to the meat use this wooden implement in the place of the knife, holding the skin with one hand, and with this wooden knife in the other making downward strokes as you would were you skinning a beef with an ordinary knife. Be persistent in the use of the wooden knife rather than use one with a steel blade, even though it may require a little more time, and possibly a little more muscle; and when the skin is off you will find that whereas the steel knife would have injured the skin more or less—quite too often it is more rather than less—the wooden instrument will neither score, hack, nor in any way injure the skin, but will leave it free from even so much as a knife mark, and, being so flayed, it will classify as "drawn off" stock.

Perhaps it is best in this connection to say that even the wooden implement should not be shaved down so as to give it a thin edge, although it should be somewhat knife-shaped, but even at the sharpest edge it should be fully one-eighth of an inch in thickness. This wooden knife should be held in the hand, not as a knife with a steel blade would be held, by the handle, but by the blade itself. That part of it which corresponds to the blade should be grasped firmly, and with the thumb projecting forward nearly to the point. In this way the knife rather serves to protect the thumb, while it, the thumb, in conjunction with the wooden knife, forms the implement with which the skin is severed from the meat. Experienced butchers say that after a little practice a skin can be taken off nearly as expeditiously with this wooden implement as with a steel blade.

We appeal to butchers not to deceive themselves with reference to the difference in value of their skins when taken off in this way as compared with them when taken off with the butcher's steel knife. We almost despair of giving advice in this particular, for we have heard so many butchers, in their egotism, assert that they could take off a skin with a knife just as well as to follow any nonsensical new-fangled directions. Permit us to say that the interests of the butchers and our interests are identical. We confess to great selfishness in this matter, because the better the skin the better we can satisfy the butchers by the returns which we are able to make; and if we can satisfy our butcher customers we can hold their trade. So let us urge, even at the expense of repeating what we have so many times said, that the classification of calfskins is so

close today that we are able to get a fancy price—at least one cent per pound more—for skins which we can guarantee to be "drawn" or "fisted off," and to be absolutely free from any knife-marks whatever, excepting of course on head, neck, and at the starting points in the center of the belly.

But little more need be said. Of course the other side is skinned in the same way. Some butchers say that having skinned well down the center of the back on each side of the calf, as you stand facing it, that it is practicable to thrust the right fist entirely around the calf, and, seizing it with the left hand, with one strong upward push detach it from the carcass so far as the hind quarters are concerned. Be this as it may, be sure not to use a steel knife at or near the roots of the tail. Of course after it has been detached from the hind quarters it is usually an easy task to grasp the skin with both hands and pull it off from the forward quarters without any further use of the knife. If, however, it does happen to stick at any point, we beg of you not to use the steel knife, but with the left hand grasp the skin and with the right the wooden implement above described, and patiently work off the skin, and when it is off we guarantee that you have saved, from an outlay not exceeding five or ten minutes additional time, from fifteen to fifty cents in the value of the skin above what it would have been worth had the ordinary steel knife been used.

Second Method.—The preliminary of ripping or slitting having been omitted, the calf having been stuck and bled and the head skinned, all as per directions herein before given, hang up the carcass, make a small slit near the center of the belly about two inches long. Take an ordinary steel such as the butcher uses in sharpening his knife, insert it in the slit and push it in to the hilt half a dozen times in different directions, that is, upward, downward, obliquely to the right, obliquely to the left, etc. Withdraw the steel, place the lips—some use a pair of old-fashioned bellows, some an ordinary syringe—where the incision has been made and with a few sharp puffs fill with air the spaces between the skin and the flesh which the steel has made. Grasp the skin with the left hand at the point of incision, so that the air which has been blown in will not escape, and with the palm or flat of the right hand strike a few blows upon the belly and sides of the calf. If this is done quickly while the body of the calf is yet warm, it will cause a separation of the skin from the flesh to a much larger ex-

tent than would at first be supposed. Now slit or rip the legs precisely as directed in Section three and slit the body from jaw to tail precisely as directed in Section two of these directions. The work of fisting off or skinning with the wooden knife, as described above, is then proceeded with precisely as though the preliminary work had been performed as in the first method.

Butchers of long experience assure me that in pursuing this method it is usually the case that the entire skin is easily fisted off without the use of any knife or other implement whatever, and after a little experience the skin can be taken off in this way very quickly. They also tell me that when the skin, as it sometimes will, adheres with considerable tenacity to the flesh it is ordinarily but the work of a moment to detach it by the following method: Grasp the skin with one hand and the wooden knife above described with the other. Then with the ball of the thumb covering or placed flat alongside the blade and well down towards its point so that there is no leverage against the wrist, make a few downward strokes of the knife and thumb, as with a steel knife, and the work is done.

The temptation is often strong to use the steel knife just a little. Don't do it. It marks the skin, and even if it does not injure it a particle in fact, we cannot sell it as "drawn-off" stock if it is knife-marked, or if there are any signs of the knife on the body of the skin. The presumption seems unquestionable that if knife-marks can be discovered at all, the skin has probably been taken off with a knife, with the necessary liability, of course, of having possible incisions that cannot be seen until the skin has been fleshed upon the tanner's beam.

6. CURING.—Never put a skin in pickle. It causes it to plump nicely at first, and the buyer may deceive an inexperienced person on stock doctored in that way, but it is only necessary to consult an old tanner to ascertain that after the skin is taken out of the brine it "falls away," that is, the plumpness disappears, and the skin can never thereafter be brought back to the same plumpness again. It becomes flat and continues flat, and, when made into leather, is never as desirable in quality, nor will it make as many pounds of leather from the same number of pounds of stock as can be made from skins that have not been pickled. Do not allow the skin to drop down into the blood, but keep it as clean as is practicable. Blood forms a water-proof substance which often-

times prevents the salt from penetrating the skin. Do not allow the sun to shine upon the skin. Do not throw it over a barrel, beam or pole. Do not allow it to touch iron. for rust is fatal to the skin.

So much in the line of don'ts. Now for the affirmative side, to-wit, what to do. Lay the skin, as soon as it is taken off, in some cool place flat upon the floor. Sprinkle it thoroughly with salt, being sure that every spot is covered. Be liberal with the use of salt, rubbing it into the skin thoroughly, either with the hand or with an old brush. Place the next one you take off upon the first one and serve it in the same manner. If several skins are taken off by the butchers in the same day, it may be best to allow them to remain exposed to the air for a half hour before packing in salt, that the animal heat may leave the skin, but in no case, especially in hot weather, should the skin be left for more than an hour before it is salted, and then in a cool place, and never exposed to the sun. Our fancy selections of skins are all fleshed over a tanner's beam before they are sent to the tannery. This process subjects them to something of a strain, and if the skins have not been properly salted as soon as they are taken off, the hair will start in the beaming process. If it starts the skin will have to pass into a lower grade.

After the skins have laid in pack a week they are ready to ship, and they are worth more to me when they are shipped fresh than they are if carried in salt for a month or two. The carrying may not materially injure them for ordinary wax leather or "wax calfskin," as skins from which boots and shoes are made are usually termed, but skins are so low in price that for strictly choice, fancy selections, we are oftentimes able to get, for specialties or fancy purposes, a larger price than we can get from the tanner of ordinary boot and shoe skins; but to get this fancy price it is absolutely necessary that we have the stock fresh. We therefore urge our buyers to bundle up their skins as often as they have a hundred or two hundred pounds and forward them to us. If they will do this, and take them off and care for them acccording to the above directions, we promise to surprise them favorably on returns therefor.

I received, last year, from a butcher living in Massachusetts, who followed substantially my above directions with reference to taking off, curing and shipping his stock, a letter, in which he

assured me that his skins had averaged him more than 94½ cents each, while the best price he had been able to obtain in Boston markets for good skins taken off in the ordinary way, and of same weight, was 70 cents. If you allow your skins to lie long in the salt, you will find on pulling them up that they have a pinkish tinge. This discoloration, however slight, is evidence that skins have laid in pack so long that they are not fit for any fancy purposes, and oftentimes they will be found to have become seriously injured even for ordinary tannages.

When you shake out your skins for shipment, allow a little salt to adhere to the flesh of the skin, especially if the weather is quite warm; and in tying them up fold in the edges and bundle them with the hair side out, putting about fifty pounds in each bundle, and tying thoroughly with good cord.

CODFISH AND TANNERS' OILS.

It may be of interest to consumers of cod and haddock, when served broiled, fried, or made into a luscious chowder, to learn to what extent the livers of these fish are used for medicinal and commercial purposes. The best species are obtained from deep water fishing, or those taken from off the Banks of New Foundland. The oil varies in color from light yellow to dark brown. For medicinal purposes, the fresh livers are immediately utilized, as the oil will be lighter in color and has not the least smell. The oil is drained, or expressed, from the livers, and clarified. The grades used by tanners are expressed from the livers by being thrown into large butts, and subjected to the oscillating motion of the vessel while engaged in fishing. Cod, pollock, hake, and haddock contribute largely to this enterprise. As the fish are taken on board, they are split open from tail to head upon the belly side; the livers and entrails are taken out, the former are thrown into the butts, and, when once filled, the oil thus forced out rises to the top and is skimmed off into receptacles wherein the water settles at the bottom and is drawn off. The oil weighs about seven and one-half pounds to the gallon. The pure oil is then put into barrels and stowed away in the hold of the "smack." The first dipping is much purer than that which follows. The latter is procured through the application of heat and pressure, to express the remaining oil from the cells. Cod livers, like lard, yield a large percentage of pure oil and tallow. The second and third runs,

although not as pure, have a fair commercial value for use on leather, wherein more body is required, and are known as "thick cod oil" and "blubber."

The chemical composition of cod liver oil has not yet been satisfactorily analyzed. "It contains a dark brown, odorless and tasteless substance called gaduine, also oleine and margarine, butyric and acetic acids, biliary principles and iodine. Chlorine and bromine are found in exceedingly small quantities. Also phosphoric and sulphuric acids, phosphorus, lime, magnesia, soda and iron. In pulmonary consumption, although not a specific, it contributes, when well borne, to the nourishment of the patient, relieving many unpleasant symptoms and often prolongs life."

The next in value are the Labrador, Straits and shore oils. These are obtained from the cod, haddock, etc., and are sold principally for leather manufacture. There is also what is known as the porgee fish oil. This species of fish are not used for food. Like mackerel they swim in schools and are seined in immense quantities upon the coast of Maine. These fish are thrown into presses like apples into a cider mill and are subjected to great pressure. The oil thus forced out is purified and sold to tanners. It is also largely used in the mixture of paints and for adulterating linseed oil, it being of a gummy nature, of good body, and for coarse painting, such as outbuildings, tanneries, etc., is more durable than linseed oil and at about one-third the cost. Were it not for its peculiar, fishy odor it could be extensively used for inside work in dwellings. The waste or scrap is used for fertilizing purposes.

This oil has given the tanners a deal of trouble. When sweet and new, little, if any, harm will result through its use; but when once it becomes rancid, and is then used without mixing with paraffine or resin oils, it will cause the leather to fry and gum, and the sides, when finished and put into packages, will eventually stick together so firmly that it is almost impossible to separate them; and then at the sacrifice of the finish. It is safer, therefore, when using fish oils, of whatever grade, unless the purchaser is thoroughly familiar with the grades and quality he receives, to use from ten to twenty-five per cent of the best paraffine oil before applying it to the leather.

Dealers in fish oils, well knowing the injurious effects of porgee oil, through frequent complaints, recommend the mixing as above,

for upper leather stuffed with paraffine or resin oils exclusively has never been known to fry or gum. It is more important that the tanner should do his own mixing; then he can tell pretty nearly what proportion of each he is using. Seven out of ten tanners cannot distinguish cod from porgee fish oil, when prepared and doctored with the cheaper grades of mineral oils. Rank fish oils may be diluted from thirty to fifty per cent, and still retain their fishy odor, and unless the tanner familiarizes himself with the several grades and their nature, so as to be able to distinguish between pure cod and a concoction of porgee, shore or mineral oils, he will be at the mercy of unscrupulous dealers. There is no surer way for a ready test than by the sense of taste. If the oil is pure cod, it will be found quite palatable after a few tests, and will not leave any bad taste in the mouth or throat. But, when mixed with paraffine or resin oils, it may be readily detected by the sharp, pungent taste, as also by the bluish cast when exposed to a strong light. The writer has frequently swallowed a half ounce or more of cod oil, when learning to test the grades, and eventually became to like it; but should the new beginner unfortunately commence with that which had been "doctored," he would not be likely to repeat the operation.

Frequently the faults of a poor finish in leather are laid to the use of oil. For instance, a case which recently came under the writer's observation: A tanner of harness leather was greatly troubled with a white scum appearing on the black side of his leather. It covered the entire body surface, and was found to be quite indelible. Only by hard rubbing with oiled cloths could it be eradicated, and then it would appear later as conspicuous as before. This was not caused through any impurity in the oil used, but from too free use of sal-soda in the mordant. Salt used in connection with the tannin will produce the same results. It is seldom that the white scum mentioned appears upon flesh finished upper leather, kips or calfskins, excepting too strong alkalies are used in the soap blacking. Tanners have been deceived so often in the use of impure oils that whenever trouble arises in the finish the oil merchant is frequently blamed without sufficient cause.

RAISE THE STANDARD.

In times of general depression, and when competition is sharp and margins close, it is a good time for tanners to call a halt, bank

the fires and examine into the numerous details and complicated processes appertaining to the manufacture, and see if there is any opening whereby some improvement can be made. When trade is booming and leather sells readily, the non-practical tanner is too apt to forget the minor details. If he finds a ready sale for his leather, even at unsatisfactory prices, he does not fret or worry himself about making improvements in the quality of his stock. He has not the time nor patience to figure up the cost or improving the quality of his products. His great ambition is to excel in his output over that of his neighbor, and is ever ready to sink a few more pits and increase his capacity. He will leave all experimenting to his more practical neighbor. Quality he considers a secondary consideration; he is working for money, not reputation, and claims to have been fairly successful during the years he has been engaged, and now feels that he can hold his own with those more practical and conservative.

This doctrine is very good, as far as it goes, but like all theories, will not bridge over the chasm when the stream is swollen, or in times of general depression, when the issue is to be squarely met; then the question arises, who can make the best goods at the least cost, and by so doing command a fair share of the trade. The theoretical, or I may say the ornamental tanner, who never performed a stroke of labor in the beam-house, tannery, or finishing shops, will, in times like the present, find it difficult to compete for a share of the trade, however much capital he may have at his command. Consequently, the future of the leather manufacture will purify itself, and will be conducted by those having practical experience and capital combined.

Tanning is an art that cannot be learned in one month or in one year. With a life experience there is something new to learn every day, and when I hear a tanner (?) make this boasting remark, "You cannot tell me anything about leather. I have learned it from top to bottom and from bottom to top," I may safely conclude that his knowledge is limited and picked up in a promiscuous way. The business has been very unsatisfactory for several years and the real cause may be thus traced: First, to a lack of practical knowledge of many who were engaged and who, as mentioned, work for money rather than reputation and that which is sure to follow, and who eventually lose what money they invested. Second, there are those who have been the means of demoralizing

the trade by the purchase of hides at prices that would not warrant a margin of profit in the manufacture by yearly increasing their capacity rather than reducing their output to within the limits of demand and raising the standard in the manufacture.

How raise the standard and meet competition when the demand is for cheaper goods, as at present? To raise the standard does not imply extra cost in time or materials, but extra care and attention to all the minute details. One expert tanner will make, from B and No. 2 hides, more desirable leather, and that which will pay fair profits to his employers, than that made from strictly No. 1 hides by a non-practical or theoretical tanner, whose smattering knowledge and assurance have won for him a position which he prides himself as fully capable of filling. His employers look more to salary than brains; if they can secure a foreman at $1,000 per year to manage a large tannery, having a capacity of 75,000 sides of upper, or double that of calf and kips annually, it is considered a sharp, shrewd scheme on their part. The manager thus obtained may be a pushing sort of a fellow—a good talker, of good habits, etc., which has great weight with his employers; but they usually put in a proviso that he must consult with them upon any proposed changes from old-time methods—how long to soak and lime the hides; how low to reduce them in the bates; how many hides or skins must be carried through the works daily, and how many each man is expected to flesh and unhair, etc. The foreman in this case becomes no more than a figure-head—a mechanical nonentity to perform the bidding of his equally non-practical employers.

Now, suppose that during the process of soaking, liming, bating and tanning, a pack, or several packs, of hides or skins should be injured? This is liable to occur daily in tanneries where the foreman or workmen are not thoroughly familiar with their work. Who, I ask, would be to blame? Would the foreman, who is merely the "Punch and Judy" to the proprietors in the background? The foreman performs the dancing and gymnastic feats, and his employers pay the fiddler.

The capital invested, the time, care, and vigilance demanded during the process of tanning, should have careful consideration with tanners who are not supposed to contribute their own services towards the manufacture. If "eternal vigilance is the price of liberty," it will with equal force apply to the making of good

leather. The successful tanners will be those having a practical knowledge; men of enterprise, system, and method. If not called upon to personally manage or oversee their business, they should be fully able to direct affairs. They should require of their foremen strict economy in each and every department. If tanning sole leather, where weight is a consideration, they should know how to secure it without injuring the quality; to study how to produce plump leather having all the desirable qualities without resorting to artificial means, as in the use of acids, and to lessen the time by frequent changes of liquors; not allow the hides to fall away from want of sufficient nourishment, or to crowd too many in a pack. Allow the hides ample room in the pits to grow and be healthy, the same as when upon the backs of the animal. "Have a place for everything, and everything in its place." Make the tannery and workshops attractive, as far as possible, to the men engaged. If you have no sheds for the protection of your bark, pack it into neat and compact piles, and well roofed as a protection from storms. Take a look at the bark-mills, and see if the product, as ground, is even and uniform. See that no filth accumulates in the soaks, limes, bates, and tannery pits. Keep an eye to all improvements in machinery and materials. The bark crusher and shaving mills recently introduced have merit, and a great saving is claimed through their use. Make a few experiments, and do not be afraid to switch off from the old routine. Commence with a piece of hide, then take a side, and should the results appear favorable, take a hide or a pack; mark them and carry along through the works, and when tanned and finished compare results. The limes and bates are a nuisance, and the time is not far distant when they will be entirely abolished. See if you cannot invent a substitute which will produce better results. It will come to you only through experimenting, and chemical research and study. Invent something, if it be ever so simple, only that it will save time, care, and material in the application. Distribute the workmen so that each shall have some responsibility. Give them your confidence if worthy. Have the men to understand that a share of the burden is on their shoulders, and they will help you carry it through to the end of the journey.

It is seldom all the qualifications will be found in one man to practically conduct the numerous processes in the several departments. He may be a capital manager, a good disciplinarian, very

important characteristics, yet be lacking in many minor details appertaining to the business. He should choose his subordinates with an eye to fitness for each department, so that the whole may harmonize. For the want of this harmony and concert of action, I have noticed in many large tanneries feelings of jealousy and discord among the men and foremen. This has a tendency to set at naught all well-known rules and methods.

In conclusion, I would urge the adoption and maintenance of system and uniformity. If the former is adhered to, the latter will be sure to follow. Never apply the saying, "Let well enough alone," until you have attained that standard There is yet a large opening for improvement in the manufacture of leather. The time was never more auspicious than now to take the initiative. The bed-rock has been reached, but not without sacrifice of capital, and bankruptcy to many. The ore is in sight; all the necessary machinery is erected for bringing it to the surface for general distribution. Those employing the most perfect machinery, producing the least friction, and properly managed, will be sure to receive their reward.

PAST, PRESENT AND FUTURE OF LEATHER MANUFACTURE.

The manufacture of leather has for many centuries been a slow-going process, in comparison to all other commodities entering into consumption. During the past twenty-five years there have been decided improvements made in lessening the time during the process to months, in place of years, as was the custom, particularly among the tanners of the old world.

Now heavy sole leather is tanned in three months' time, where it formerly required from six to nine months, and in many instances from one to two years. Wax upper and grain leather is now tanned and finished in from fifty to sixty days, where thirty years ago it required from four to six months.

Both sole and upper leather, now tanned by the quicker process, are far superior to that made in years gone by. When this radical change from olden-time principles was first inaugurated, there was a great hue and cry among consumers of leather, that it would not give equal service, and that the leather was burned in hot liquors in the endeavor to facilitate the process. There are those at this late day who are of that belief, all arguments that could be

raised would fail to convince them that upper leather, as now manufactured, will outwear that made on olden-time principles, besides affording greater comfort and protection to the feet of consumers.

The ice has been broken, and before the era of another century dawns upon the tanning industry, there will be witnessed a complete revolution in the art of making leather, not only by further lessening the time, but in producing a superior article, both in sole and upper leather. Already patents have been granted for a process to hasten the tanning by electricity, and from numerous experiments made, sole leather has been tanned in from ten to twelve hours' time. The hides are prepared in the usual manner in the beam-house and then placed within rotating drums, Liquor of the required amount and density to thoroughly tan them, is run in, when a current of electricity is applied, and in a surprisingly short time the hides are fully tanned, and it is claimed that hides so tanned yield as great a percentage of leather as by the long and tedious process of handling and laying away in the pits. By this process there will be little, if any, waste of the tannic acid. In fact, the liquor has not time to decompose and produce gallic acid, so destructive to tannin. Extracts which can be applied at a higher density, wherein weight and solidity of leather is a consideration, will be more generally used. These changes are as sure to be witnessed in the immediate future as that the World's Fair is to be held in Chicago in 1892, and that sole and upper leather tanned by the aid of electricity will, without doubt, be there on exhibition.

The claim has always been that, could the millions of pores of the hide be kept open during the process and the fibers agitated, the hide could be tanned in a few hours, similar to that of coloring cotton or woolen fabrics. Electricity has a similar effect on the hide as does the sense of sight to the cat when a dog intrudes on her domain; the numberless hairs instantly arise, standing erect awaiting the charge.

Repeated experiments have proven that by the continuous agitation of hides while immersed in the tannic acid, it will unite with the fiber and gelatine in a comparatively short time. When hides are suspended in the pits and the liquor occasionally agitated, just sufficient to gently fan the fibers, the time in tanning will be reduced fully one-half over the old method which keeps them lying in a dormant condition in the handlers and layaways.

Let us go further, passing over a period of ten or more years or to the opening of the twentieth century, when still greater wonders will undoubtedly be witnessed in that of converting the raw material into leather. The hides will then be soaked in the usual manner, the dewclaws, fat and flesh removed and then submitted to the quick process of unhairing by immersing them in a strong sulphide of sodium bath, which will remove the hair in from five to six hours without injuring in the least the fiber and gelatine of the hides. Bating and fine-hairing will be dispensed with, and after a good washing in the wheel, the hides will then be put into tanks of boiling water containing acids and alkalies and the compact structure disintegrated, the fibers and gelatine reduced to a pulp, as the excess of water is absorbed by the required temperature of heat. At this stage oak and hemlock extracts are run into the tank in such quantity as will be necessary to tan the pulp, the tanning process of which will be instantaneous. The pulp, consisting of tanned gelatine, fiber, cuticle and corium, will then be run off into large, shallow pans to cool. Yankee ingenuity will in the meantime invent a cuticle or substitute for the grain which can be applied in liquid form soon after the pulp is run into the pans, and during the drying become uniformly united with the former ingredients.

The several substances of sole or upper leather may be graded when running the liquid pulp into the pans, as in the manufacture of paper. The pans are then placed on racks in the lofts to dry, and, if for sole leather, when in proper temper for rolling, the strips are taken to the rolling machine and submitted to a heavy pressure, when the gelatine or fiber will become as firmly united as when in the original hide.

The advantages to be derived through this prospective process of tanning would be numerous. In the first place, nearly all of the offal on the hide can be utilized. Calf, kip, cow, steer, and bull hides, can be worked together, and produce uniform results. It will not require as much tannic acid to tan the pulp as it would to tan the hide in its original condition. No tanning pits leaches, bark mills, or bark sheds, are requisite should extracts be used. The number of hands employed by the present method could be reduced about one-half. Skiving, splitting, and shaving, would be dispensed with. With no offal or splits, shoddy soles, counters, etc., would be among the things of the past. Every portion of the

leather could be cut into soles and uppers without waste, and be of uniform substance and quality. Strips of leather, say ten feet long, and four feet wide, could be more economically manipulated in the several departments in the finishing. For upper leather finish no scouring would be required, and the strips taken as dried from the pans and tempered, if for stuffing by hand or wheel in the usual manner when set out, could be dry-glassed on both sides by machine before blacking. Harness and belting strips of any desired length, width, and thickness, could be produced when running the pulp to the pans. Boots and shoes of every style and substance may be molded from the pulp, and without stitch or seam. With all these advantages, who will take the initiative?

KANGAROO LEATHER.

KANGAROO HIDES FROM AUSTRALIA TANNED IN AMERICA.

The Newark, N. J., correpondent of the *Globe-Democrat* says in that paper:

There are 6,000 kangaroo skins received in this city every week. They are all tanned in one large establishment on Sussex avenue, and are then made into fine shoes for both sexes. Australia and New Zealand furnish kangaroo hides for the world. The kangaroos are killed in Australia, about 300 miles back from the coast, and are shipped from Melbourne, Sidney, and Newcastle, in Australia, and from Masterton, in New Zealand. Until 1869, the kangaroos were killed and eaten in Australia, and their hides were cut up into shoestrings. But an Englishman named Brown, in that year discovered the wonderful consistency of the grain in the leather and brought several thousand skins to this country. He tried to sell the hides to tanners, but they were shy of the novelty, and he had to sell them at a sacrifice to a bookbinder. The bookbinder made triangular corner pieces in ledgers and commercial books out of the skins, and so discovered the good quality of the leather. It was in this way that the big leather men were first attracted to kangaroo hide. The skin was found to be very tenacious and the grain was three times as thick as any other. The compactness of the grain prevents its absorbing the water, while the acids in blacking meets with an almost impervious substance.

Eight men hunt together for kangaroos. They are called "a set." When brought to bay, the kangaroo jumps like a flash for the hun-

ter's chest and tries to crush it in with a stroke of his hind foot, which is very powerful and armed with a terrible claw. To prevent this, each man wears across his breast a two or three inch thick matting. Armed with a spear, with a club attachment at the other end, they ride upon swift horses into a herd. With the agility and equipoise of circus riders, they stand erect upon their steeds, rarely falling off, and use their spears and clubs dexterously.

The kangaroo is able to jump clear over a horse. As the game is bagged it is deprived of its coat, which is stretched on the ground and pegged down to prevent shrinkage, while the flesh furnishes meat to the camp. Each man places his private mark on his booty, and when 100 apiece are obtained, they return back to civilization.

There are twenty different sorts of kangaroos; among them the blue, red, Wallaby, black, gray and forester, the latter furnishing the best leather, as it lives mainly in wooded sections. When the shipping ports are reached, the hunters dispose of the skins by auction to the highest bidders, and realize about seventy cents a pound. Kangaroo hunters make fine livelihoods, their gains often amounting up to several thousand dollars per year, while one man is known to have cleared $4,500, free of living expenses.

In an interview recently, Mr. Salomon said that the tanning of kangaroo skins is confined to men employed by Americans, as other dealers cannot afford to pay the high prices for the raw material. The result is that Parisian and London shoe manufacturers buy their stock of kangaroo leather directly from Newark, and prominent dealers in Germany, Greece, Spain, and even Australia itself, obtain their supplies from the same New Jersey source. The trade has obtained such a magnitude that the 6,000 skins received and tanned here weekly are almost inadequate. Thus the strange animal discovered by Capt. Cook, a century ago, and christened "Macaropas Major," by scientists, has become an important element in commerce; and the "Booma," or old male, who, when domesticated, becomes a devotee to beer drinking, finds himself serving as a foot-covering for the effete scions of civilization.

ORIENTAL TANNERS.

In addition to sandals, says *Leather*, the Egyptian curriers made the covering of seats of sofas, bow-cases, quivers, the furniture of war chariots, and the decorations of harps and shields.

Stamped and beautifully embossed leather straps have been frequently found fastened round the mummies. The practice of stretching the tanned skin on a wooden frame, as is the custom of European saddlers, and the semi-circular knife in vogue with the curriers of the present day, are both distinctly represented at Thebes. The shoemakers are one of the very lowest casts in India. Leather is considered unclean by the Hindoos, and consequently those who work in it are defiled. It is alleged of the shoemakers that they eat the flesh of domestic animals that die a natural death. They drag or carry away the carcass to their own part of the town or village, cut it up in pieces, and distribute the flesh among themselves in sufficient portions, and clean the hide and put it away for sale, or to be manufactured into something.

It is a singular circumstance that the Chinese have no acquaintance with the process of tanning by vegetable juices, but use only mineral and animal substances; hence the inferiority of their prepared skins.

The myriads of victims slain in Jewish sacrifices must have afforded the skin market a copious supply. The scarcity of glass, pottery and earthenware would, however, cause a constant demand for leathern bottles and drinking vessels, and these, by reason of climate, defective manufacture, and by exposure to the process of fermentation, were very perishable; perhaps even more so than the brittle vessels of glass and clay.

Only one tanner is mentioned in the Bible—the Simon who was, in all probability, a member of the church at Joppa, and in whose house Peter found a temporary home when the messengers of Cornelius were informed: "He lodgeth with one Simon, a tanner, whose house is by the seaside." There are numerous wells of water in close proximity to the town of Joppa. This would render it a suitable locality for a tannery, and the adjacent port would facilitate the shipments of a cargo in great request, not only through all the Mediterranean coast, but far up the Nile, and among the semi-civilized dwellers of Northern Europe. Several tanneries of great antiquity still exist near the shore, one of which is said by tradition to have been that of Simon, the tanner.

We have many pieces of skin and leather from the Egyptian tombs in a state of perfect preservation, which passed through the hands of the tanner more than thirty centuries ago, and which, but

for the invention of this process, must have perished in a few hours after they had left the carcasses from which they were stripped.

HEALTHY HIDES.

Every little while a great hue and cry is raised of some dreadful disease being communicated by tanners' stock, notably hides received from some condemned animals. If there are any diseases of an infectious character that can withstand salting, drying, liming and so on, and still retain the germs of spreading the same, I would like an opportunity of examination. It is next to an absurdity to reason that among the few disorders that are susceptible to inoculation and contagion from a lower to a higher order of animal life, there is but a small proportion but what cease to be susceptible of being conveyed after the animal upon which they fed and were propagated, is dead, for with many of these the life of the animal proper is indispensable to the parasite. Sometimes, as with the aniledes, which depend upon the death of certain portions o the animal inhabited for some of their many transformations, this may be so, but with disease, in the ordinary acceptation of the term, as stated before, the case is entirely different. It might be possible for disease to be communicated from one member of the same species to another in hides, as cases are known of certain well-defined typhoid and kindred loathsome disorders being carried from one section to another by means of rags, clothing, and other fibrous materials, but most invariably among the same species where originated, but cases of transmission of disease in this manner are very seldom, if ever, met with, and more especially the disease of one species to another.

While it seems unreasonable to suppose that disease which may have existed in the cuticle or blood corpuscles of the animal can retain its virility after the hide has been passed through the limes and the various processes of tanning, it may be possible that some of the chemical agents used in the preparation of the smaller skins produce ill effects on the human species, who may wear them in the form of shoes, etc. Goat and kid skins, for example, are coated with a seasoning liquid to render the skin susceptible of receiving the "glaze." This fluid contains blood, often in a more or less advanced stage of decomposition. As the seasoning liquor is only used on the finished side of the skin, it seems scarcely possible that blood poisoning could be induced in the wearer of a shoe whose feet only come in contact with the flesh side of the leather

CHINESE HIDES.

The Austrian commercial journal, *Das Handels Museum*, devotes a long article to a discussion of the trade in hides from China. These form the principal articles in the trade of China with Austria-Hungary and are the chief cargoes of the Austrian Lloyds steamers from Hong Kong. In 1887 68,269 piculs of hides were shipped to foreign countries, against 77,735 in the previous year. It was not until 1876 that the export to England and America attained any importance, but it then increased with great rapidity. The first shipment to the Mediterranean took place in March, 1881, and this was to Trieste. Chinese hides are strong, sun-dried and have a short hair. In the earlier years the purchase, preparation, packing and shipping were all done at Shanghai. The work has gradually shifted since 1885 to Hankow. The shipment to Great Britain and North America is in British, that to the continent of Europe in German hands. China is really not a hide producing country like India, Australia and South America, where there are vast pastures for herds and large slaughtering establishments. In China a consignment is collected with care and trouble in small rural villages, frequently in the most remote parts of the western provinces and always by Chinese merchants. They are, therefore, often weeks and even months before they reach the port of shipment, and this is doubtless the reason why the market has largely shifted from Shanghai to Hankow. The different sources from which a single shipment is derived and also differences in treatment account for the great difficulty which is experienced in obtaining a like quality. The food which the animal has been accustomed to get has naturally the most important effect on the quality of the hide. When the hides arrive from the interior they are soaked, those which are cut or otherwise injured being taken out for use in the locality. Those for export are cleaned, the heads and hoofs are cut off and they are treated with a preparation to prevent putrefaction and the ravages of worms or insects. The freight for hides from Hankow to Trieste is twelve taels per ton. Difficulties are constantly arising on account of the tricks of the Chinese dealers, who add substances to increase the weight and hide defects in all manner of ways.

VACUUM TANNING.

The vacuum process of tanning has long engaged the attention of inventors. Various substances are preserved by this method and

theoretically the idea appears to be reasonable. If space is first relieved of whatever fills it, natural law will operate to assist in replacing that which is removed by the particular substance arranged at hand to serve as new filling. Nature abhors a vacuum. But there is a difference between theory and practice. The question is, can the new filling be properly provided and adjusted? Another vacuum tannage has been patented by Lanvin Schruen. It is described by the London *Leather Trades Circular and Review.* The machinery employed is a vessel which can be hermetically sealed at will and which contains frames on which are hung the hides, and to which a rocky motion is given by means of a rod passing through the side and connected with an eccentric. A reservoir of tanning liquor is connected with a high-level vat, into which the liquor is pumped, from whence it runs down into the tanning vessel, passes through it into the reservoir below, to be again pumped up and so keep up a circulation of tanning liquor amongst the hanging and oscillating hides. By means of stopping the communication between the high and low level reservoirs the air may be exhaustively pumped out of the tanning vessel and the hides subjected to vacuum tanning, as ordinarily understood, by the tanning liquid being allowed to rush into the vacuum and rapidly penetrate the pores of the hides. The processes in alternation are claimed by the inventor. Vacuum processes either in the strict or modified form were patented as far back as 1857, and Eason's patent of 1859 provided an air-tight tanning vessel, in which revolved a frame carrying the hides. Air was exhausted and tan liquid supplied to rush in at the proper moment and fill its place, pressure being afterward used to still further force the tannage. Hamer, in 1863, employed an air-tight box containing a rocking frame for the hides, and in 1866 Macrum used the alternated process of air and whole or partial vacuum. This inventor claimed both pneumatic and hydrostatic pressure in his processes.

ANALYSIS OF TANNIC ACID.

There are, indeed, at the present time, very few people who deny the value of science in the development of industry. In many branches of industry the investigations of science have brought forth undeniable practical results.

But one of the branches which, in this respect, has been rather neglected, is the tanning industry. This has developed almost ex-

clusively through practical experience, and has, up to the present, received but little aid from science.

And yet chemistry enters upon this field largely. "It is skill, not force, chemical knowledge, not steam power which is principally, in the future, to accelerate and cheapen the process of tanning. Our inventors must aim to be good chemists, as they are already good mechanics."

The discovery that bark had the effect of converting the skins or animals into leather was doubtless the result of accident, and the principles of its action have been nearly unknown up to the present century. This mainly is due to the fact that chemistry itself in this special branch is insufficiently developed.

We have reached the point at which we can, with confidence, state that tanning is accomplished by tannic acid, under which name the chemists include a number of non-nitrogeneous substances, consisting of carbon, hydrogen and oxygen, possessing no smell, but a well marked astringent taste, and producing characteristic precipitates in solutions of metallic salts, principally those of ferric salts, also a tendency toward precipitating gelatin matters and converting hides into leather.

About the chemical nature of these substances we have but little knowledge. In fact, the only true chemical form and combination of tannic acid that is known, is the one contained in nutgall, the gallo-tannic acid or tannin, the real character of which was discovered in 1871, through the investigation and analysis of H. Schiff. He proved that the formula of tannin was C_{14} H_{10} O_9, viz.: Fourteen atoms carbon, ten hydrogen, and nine oxygen, and not, as previously supposed, a glucoside, but what chemists would term digallic acid. The tannic acids of other substances were a long time considered identical with tannin; but a more thorough investigation has enabled us to separate them in many varieties.

Among these the tannic acids contained in oak and hemlock bark have probably been of the most practical value, but we are still in ignorance as to the chemical combination of these.

Thus we find, in examining some of the best analyses of oak bark, that, according to Etti, the tannic acids of oak bark are designated as follows: C_{17} H_{16} O_9, according to Boettinger, C_{19} H_{16} O_{10}, and Oser C_{20} H_{20} O_{11}.

We know still less about the tannic acids of other barks, as spruce and hemlock, for example.

It is not surprising, under such circumstances, that the methods of analyzing tannic acid are, as yet, very unsatisfactory.

The many different methods existing, unerringly show the importance of a true knowledge of the real nature of these acids—a knowledge which is of unquestionable value to the practical tanner, enabling him to learn the exact percentage of tanning properties contained in the material he uses, as well as the real strength of liquors used in his tannery.

For these reasons we have considered it to be of some interest to the tanners of the United States to have the facts and results of some analyses of hemlock liquors and barks made known to the public. These analyses are the result of visits to some of the principal tanneries of hemlock sole leather throughout Pennsylvania and New York, during a journey, undertaken with the aim of investigating and studying the tanning industries of America, at the expense of the Swedish government.

I am entirely justified in publishing the result of these analyses, as they are made wholly at the expense of myself and Gabriel Hallstrom, of La Porte, Pa., and I do it most willingly, because the courtesy I have received at the different tanneries has been the most cordial, and any information wanted by me has been most cheerfully and unhesitatingly furnished.

But, before we proceed further, it seems proper to present a summary of the different methods now in use; also, to explain thoroughly the one used in these analyses.—*Landin, in Scottish Leather Trader.*

TANNING EXTRACTS AND MATERIALS.

Abstract of a lecture delivered to the German Tanners' Association by Mr. W. Eitner, director of the Vienna Experimental Station:

This subject is an important question in modern tanning, a question which is looked upon by some tanners as satisfactorily decided, while others consider it yet open for discussion. We will, therefore, review the matter by first explaining the application of tanning extracts; then how the extracts are obtained from different materials, and how well they are adapted to cause that transformation in our leather industry which is necessary to enable it to compete on the world's markets. After that has been settled to our satisfaction, we will proceed to discuss the most rational method

for manufacture of leather by means of extracts from the different tanning materials, and the circumstances under which their application is most suitable.

It is not very long ago when every continental tanner sneered at extracts, and proclaimed them as entirely unsuited to the existing conditions, although American and English tanners had long ago used them, and by their products demonstrated that such tanning methods not only satisfied the home demand, but were fully able to compete with others upon the world's markets.

Of course the products obtained by English and American extract tanning differed somewhat from those produced under the old system, and these differences were magnified to such an extent that the leather was decried as unfit for our use, and altogether harmless so far as competition was concerned. But this soon proved to be a mistake; the extract tanned leathers were, in the beginning, purchased on account of their cheap prices; later on when it was demonstrated that the material was good, the demand increased and our tanning interests was reduced so low that high tariffs against this invasion of extract-tanned leathers were introduced in the different countries. Not until then did the tanning by extracts receive any attention, and experiments made proved, in part, satisfactory, while others were failures. Opinions about the efficiency of the new method began to differ, although they had been unanimous in its condemnation before. The good results increased in number with more experience, gaining new advocates at every step, so that, taken all in all, it appears to be only a question of time, when all the tanneries in continental Europe shall use extract. At present we find ourselves in a transition stage.

The oldest method of extract tanning is the English. Here all uppers and lighter skins are tanned exclusively by extract; heavy leathers only have, towards the latter part of the tanning process, a small quantity of solid tanning material added to the baths. The first preparation is made in a vessel which holds about twenty to twenty-five hides, and has an internal rotatory device by means of which the hides are kept floating in the bath, and are constantly in motion. In this they are kept about six hours. After that the tanning itself commences, which is divided into several groups, each of which contains from six to eight baths. The baths of the first group are mostly made from the exhausted liquids of the later

groups, to which a little weak fresh extract has been added. A grading of these earlier baths is impossible, because the old liquids hold many substances, the presence of which is not due to the tanning material. Besides this, a grading would here be useless and uncertain, and it is best left to the practical experience of the tanner to determine what action the bath exerts. On the other hand, if we are so situated that we can analyze the bath for tannin, we do not find it a very difficult matter to obtain a correct estimation of the complicated liquid.

The skins remain in the first baths only for one day and are then placed into other vessels which contain the next stronger bath, made in parts from fresh but weak extracts and in parts from later exhausted baths. The first shift is finished in eight days. In the second shift, which is again divided into a series of eight baths, the skins are treated in the same manner as the first; here also the liquids of later baths are utilized, to which some stronger extract is added.

The second as well as the third shift, which is manipulated in the same way, take up from eight to nine days each, during which time the hides are placed every day, and sometimes twice a day, into a stronger bath. These three shifts of the English extract tanning do not differ very much from our own method. The difference consists principally that the English baths are richer in tannin but poorer in acids than ours and that their strength can be increased in a systematic way and in shorter periods. In the English as well as the continental methods it will be difficult to obtain any correct estimation of the strength of the bath by means of the hydrometer. This is better left to the practical experience of the tanner himself. The strength obtained by this instrument is not reliable and often differs in extracts of identical tannin contents obtained from different materials. So, for instance, fir extract of the same absolute strength has a higher specific gravity and consequently would give a high gradation by the hydrometer than oak or valonia extract. The grading is, in addition to this, affected, whether change of baths take place regularly or not. We can well start with the basis that during the second shift the difference in strength between the first and eighth bath must not be large, never more than four degrees. This would be equivalent to 0.3 to 0.4 per cent in tannin. These figures demonstrate very conclusively that the increase in the strength of the baths in the earlier

stages of tannin is exceedingly small. During the third shift the baths are made a little stronger. The difference between the first and eighth is six degrees or one-half per cent of tannin, so that at the end of the third shift the bath registers ten to twelve degrees or one per cent tannin. The last bath in the first shift contains generally 0.25 per cent of tannin, but registers many more degrees than its equivalent. The last bath of the second shift contains about 0.6 per cent of tannin and will register about eight degrees. But baths, as well as their successive increase in strength, depend largely upon the hides to be tanned. The above figures apply to ox hides and oak or valonia extracts. Buffalo hides need stronger baths and a more rapid increase of strength. Upper leathers, especially calfskins, must be kept milder. Horsehides, again, can be treated in stronger baths and with a rapid increase of strength

A STUFFED HUMAN SKIN.

Vienna cable to New York *World:* Few persons are aware that until a short time ago the natural history collection in the imperial palace at Vienna included among its most remarkable curiosities the stuffed hide of a human being. The recent discussion concerning the card cases manufactured at Paris, of the murderer Pranzini's skin, has recalled attention to the fact, and to the romantic history of the man who has so long figured in the Austrian emperor's private museum. The name of the original owner of the hide was Angelo Soliman, who, notwithstanding the fact that he was a coal black negro from the Soudanese tribe of the Gallas, was nevertheless the ancestor and grandfather of several of the most noted members of the Viennese aristocracy.

One of his grandsons is the Baron Ernst Von Feuchtersleben, who held a cabinet office for several years, as imperial minister for the public worship department. Another of his grandsons, the Baron Edouard Von Feuchtersleben, is a celebrated author and poet, while several of his great-grandsons hold high rank in the imperial, diplomatic and military service. On two days a week until quite lately these members of the Austrian nobility had the extraordinary privilege of being able to visit their stuffed ancestor, who, seated in an arm chair, with his perfectly preserved features and staring glass eyes, presented a most life-like and uncanny appearance. The history of Angelo Soliman is as follows:

In the year 1740 Prince Lobkowitz, one of the principal gener-

als in the imperial Austrian army, happened, while visiting the city of Messina, Sicily, to have his attention drawn to a little seven-year-old negro boy who was acting as page to one of the noble ladies of the place. The child was asserted to be the offspring of a native king, and was said to have been kidnapped from his home and sold as a slave at Cairo. By some means or other he had come into the hands of a sea captain trading between Alexandria and Sicily, who had brought him to Messina and presented him to the lady in question. The latter had caused him to be baptized by the name of Angelo Soliman. Prince Lobkowitz took a great fancy to the boy, and persuaded the lady to let him have the child and take him into his service. Angelo followed his new master everywhere, was present with him throughout all the campaigns, and received a most careful education.

On the death of the general, he entered the service of Prince Lichtenstein, as tutor of the latter's children. Angelo had become a remarkably learned man. He spoke perfectly several languages, French, Italian, German, Latin and Czech. Although of small stature he was wonderfully well built; his features, although as black as charcoal, were of a Caucasian rather than of an Ethiopian cast, and his hair, beard and mustache were silky and curly. His manners were distinguished by the most exquisite courtesy, and, dressed in his flowing oriental robes and snow white turban, he was one of the most popular members of the best Viennese society of the day. A noble widow, the Baroness de Ochristianne, fell deeply in love with him, and in due time a marriage took place. For some reason or other Prince Liechtenstein viewed the union with disfavor, and quarreled with Angelo, who thereupon left his service.

He was, however, very comfortably off, for not only was his wife very wealthy, but he himself had just a short time before won the principal prize of 20,000 florins in the Frankfort state lottery. He purchased a pretty house and garden in the suburbs of Vienna, and lived there most happily with his wife, devoting himself to the education of his daughter Josephine, the only issue of the marriage. The young girl was one of the most fascinating and beautiful types of the mulatto imaginable, and after refusing a large number of offers, at length gave her hand in marriage to one of the imperial counselors of state, the Baron Von Feuchtersleben, from whom the present bearers of the name and title are descended in

direct line. Angelo, who had before his death become reconciled to the Liechtenstein family, went over to the great majority in 1796, being 75 years old at the time.

The emperor, who had always shown a great fancy for Angelo, conceived the peculiar idea of preserving his old friend, stuffed and in a glass case. Strange to relate, Angelo's family, far from being offended, expressed themselves highly flattered by the imperial request, and immediately consented to surrender the remains to the court taxidermists. After having a cast made of his face and body by the famous sculptor, Franz Thaller, the skin was carefully removed from the body, subjected to a number of chemical preparations, and finally stuffed with great care. It is only quite recently that this somewhat uncanny object has disappeared from the imperial collection, owing, if I remember rightly, to its having been almost destroyed by the rats and mice.

TANNIN FROM CANAIGRE.

While men are endeavoring to collect materials for use in manufacturing, and imitate natural products to accomplish certain results without manufacturing, nature, in her efforts to maintain her prestige, presents other materials to supersede or take the place of those being exhausted. Tanners, like members of all other important industries, are daily importuned to try new materials for accomplishing certain results; thus, we have a variety of preparations, good, bad, and indifferent, while some have a positive pernicious tendency. It is plainly a matter of grave importance that great care is exercised in the selection of tanning materials, especially from the many brands now on the market of artificial processes.

A new candidate for tanners' favor is the canaigre root, from Northwestern Texas. The roots are from four to six inches long, by about an inch in diameter; they resemble sweet potatoes in form and general appearance. In transverse sections they are of a bright lemon color, getting red-brown by exposure to the air. As analyzed by a chemist of Galveston, they were found to contain:

	Dry.	Green.
Water	11.17	68.07
Tannic acid	26.30	8.50

This tannic acid is the variety known as rheo-tannic acid, and is identical with that existing in rhubarb. In many respects

canaigree root resembles rhubarb, and the following analysis has been made with a view to determine, if possible, the value of canaigre root, either as a tanning material or a medicinal substance. The following are the percentages, extracted by solvents from the air-dried root, which contains 11.17 per cent of moisture, as estimated by Prof. Elsom :

Cold water	41.48	Petroleum ether . . .	.90
Alcohol, 98 per cent . . .	44.01	Chloroform	.92
Alcohol, 85 per cent . . .	48.19	Carbon disulphide . .	.96

Ether extracts varying amounts, according to the time it is allowed to act. It will be observed that petroleum ether, chloroform and carbon disulphide extract nearly the same amounts. The extract thus obtained was a yellow, soft, solid substance, freely soluble in alcohol ether, benzole, carbon disulphide and chloroform ; insoluble in water. Its solutions have a faintly acid reaction. It is soluble in greater part, in alkaline hydrates ; with a beautiful pink to carmine color. Its faintly alkaline amoniacal solution precipitates acetate of lead, pink and reduces potassium permanganate in the cold, and apparently reduces silvernitrate. This substance has been called *yellow resin* in this analysis, although it may obtain traces of oil, chrysophanic acid and emodin. Alcohol extracts the above *yellow resin* and a red-brown substance, in some particulars resembling the *erythroretin* of Schlossberger and Dopping.

This substance, when dried, is a brittle, red-brown solid, not fusible on the water bath ; soluble in alcohol and diluted alcohol ; insoluble in water, and nearly insoluble in either chloroform, benzole, petroleum ether, carbon disulphide. With alkaline hydrates it dissolves to a purplish-red solution ; excess of acid re-precipitates the substance. Alcohol also extracts the rheo-tannic acid, already mentioned, together with some sugar, and a red substance soluble in water.

Water extracts this red coloring matter, a brownish coloring matter, insoluble in alcohol, ether, fat, together with gum, pectin and sugar.

Dilute potassium hydrate, used after the substance had been thoroughly extracted by alcohol and water, was colored a dark, purplish red.

When acidified, the solution precipitates blocks of a deep, red-

brown matter, much resembling the red substance extracted by alcohol, but differing from it in being insoluble in alcohol.

In all these particulars this substance exactly corresponds with *aporetin*, and, accordingly, it has been so designated in this analysis.

The root contains considerable starch; the starch grains were medium sized, round and ovate. The starch was converted into glucose by dilute sulphuric acid, and estimated from the glucose formed. Albuinoids were calculated from the total nitrogen, by combustion with soda-lime.

Cellulose was determined in the residue after the extractions of all the above named substances. Moisture, from loss of weight, at 110 to 112 degrees, C; ash, by simple combustion.

The figures given are for free ash substances; and direct estimations were made in every case, except for sugar and "red substance soluble in water. Oxalic and malic acids were not estimated.

ANALYSIS OF CANAIGRE.

Emodine	Trace
Yellow resin	.93
Red substance, soluble in alcohol	10.48
Red substance, soluble in water Sugar	10.44
Rheo tannic acid	23.45
Gum, pectin brown color	6.41
Albuinoids	6.21
Aporetin	4.78
Starch	18.00
Cellulose	4.52
Ash	4.38
Moisture	11.17
	99.77

Whether this root is valuable, either for tanning purposes or for medicinal use, must be determined by actual experiments. The result of the analysis fails to show the presence of any substances that would prove injurious to leather, and the large proportion of tannic acid is a favorable indication. In many particulars, this root resembles rhubarb, and it seems probable that it may be used to advantage in place of rhubarb, where a more astringent medicine is indicated.

The rapid change of the fresh root from yellow to brown, may be due to the change of yellow resin into the less soluble red-brown substances. PROF. J. F. ELSOM.

SPONTANEOUS COMBUSTION OF LAMPBLACK.

Fires occurring from spontaneous ignition of vegetable black are very common. Oily rags are more liable to self-ignition during the summer after a continuance of dry, warm weather. A sudden storm or a shower of rain appears to give life, as it were, to the parched-up matter, and a fire is the result. It has been also noticed that the reverse occurs after a continuance of wet weather. A few days, sometimes, are sufficient to set up active and rapid combustion, especially among sweepings in paint and oil stores, consisting generally of wood dust, dried vegetable and animal powder, colors more or less saturated with varnish, turpentine, oils, etc. Lampblack, if packed in a leaky cask when freshly prepared, condenses the atmospheric gases on its surface, which, owing to the porous nature of the substance, is very large in proportion to its weight. In condensation the gases give out a certain amount of heat, which, under favorable circumstances, is sufficient to cause the ignition of some inflammable substance accidentally present, which, by combining with the condensed oxygen, liberates heat enough to cause the ignition of vegetable black, which, when once started, soon spreads until the contents of the cask become red hot.

This spontaneous ignition is not infrequent in many large carriage factories, and builders' shops have been destroyed solely from this cause. To put it in printed paper would insure ignition from the absorption of oil in the printing ink by the lampblack, generating gas which would soon ignite the soot or lampblack. One among many instances of well attested cases of spontaneous ignition is described in the *Paint, Oil and Drug Review*. It occurred at a large carriage works at Grantham, England, in a shop far away from fire or the chances of a spark. The paint shop was gradually illuminated on a mild summer's evening during daylight. It was noticed through the workshop windows, and was seen to be a tub of loose lampblack slowly consuming the cask. It was easily carried out on to the grass to finish its work. It was thought that, being near the grinding-paint stone, some oil had been splashed into it, or an oily rag dropped into the lampblack. The secret was soon found out by the palette knife being found among the ashes

of the cask, having been carelessly dropped in with some wet paint on it; or even without any wet paint, the dry, oily paint which accumulates on the blade near the handle would be sufficient to cause ignition. It is not the large quantity of oil, but the small quantity, which is the cause of it. This is so well known that some coach makers, when they receive lampblack, put it into a sound cask, and pour enough linseed oil into it to saturate the whole.—*Scientific American.*

TANNING BY ELECTRICITY.

Making leather is now essentially the same in principle as it was in the days of Pharaoh. Improvements have been made in the methods of depilating, or removing the hair from hides and skins, and machinery helps to forward the work in both tanning and finishing, but the aid of a vegetable astringent—tannic acid—is necessary in combination with the gelatine of the hide to make true leather. And this is a long operation, requiring, for sole leather, from four to eight months, and the lighter harness and upper leathers less in proportion. It is now claimed that this long tanning process can be shortened by electricity, and an English patent has been issued with this object. It is well known that hides being "sweated" for unhairing give off a great deal of ammonia, from the combination of the nitrogen of the gelatinous tissue with hydrogen. This process of decomposition is immediately checked when the hides go into the tan liquors, but the precise chemical reactions which take place in the vats have never been clearly understood. In heavy sole leather it is claimed that, in many cases, tannin is deposited by precipitation in the hide cells, besides that which is directly taken up by combination with the gelatine.

The new process proposes to hasten the tanning by enhancing chemical affinity by means of electrical currents, and thus making these reactions more active. The method is to pass a current of electricity through the vats containing the tannin infusion and the hides. The vat becomes simply a large voltameter, in which gases are evolved by the decomposition of water—hydrogen at the cathode and oxygen at the anode. The arrangements are such that the hydrogen alone acts upon the hides, where it rapidly combines with the nitrogen of the tissues and produces decomposition of the gelatinous matters. After a short period, according to the usual manner of changing tan liquors, the solution of tannin is re-

placed by a more concentrated one, and the current is reversed in direction, so that oxygen is evolved among the hides, where it oxidizes the tannin and precipitates it in the pores and intercellular spaces in the tissues.

CUTCH AND WATTLE BARKS.

The acacia family of plants is an important one to tanners in many parts of the world, and especially in extra-tropical countries. In America our abundant supply of oak and hemlock bark prevents, to a great extent, large importations of tannins derived from any of the members of the numerous family of acacia. But in countries such as Great Britain and those of the continent which are not so favorably situated as the United States, the importations of terra japonica, derived from acacia barks and heartwoods, are very large.

Acacia catechu is indigenous to India and Africa up to an altitude of about 3,000 feet, and the extract prepared from the bark and heartwood of this tree is the cutch of the tanner, four tons of the bark producing one ton of cutch or terra japonica. Acacia cavenia is the espino of the present inhabitants of Chili and the cavan of the former population. The tree is a small one, but the wood is very hard and resists underground moisture, the husks yielding about thirty-two per cent of tannin.

Acacia cebil is indigenous to the La Plata states and is a very valuable tree on account of its bark, which yields a very high per cent of tannic acid.

Acacia decurrens, commonly known as the black wattle, is a medium-sized tree and flourishes from the eastern part of South Australia, through Victoria and New South Wales, to the southern part of Queensland.

The richness of this bark in tannin and the yield of a gum similar to gum arabic make the black wattle a very valuable tree. In Melbourne the price of the bark averages about $25 per ton, the price in England ranging usually from $40 to $55 per ton. Melbourne tanners commonly consider one ton of black wattle bark sufficient to tan twenty-five to thirty hides, the bark being best adapted for sole leather and other heavy tannages, the leather produced with it being considered equally as durable as that tanned with oak bark and nearly as good in color. It is claimed that one and one-half pound of black wattle bark will give one pound of leather, whereas five pounds of English oak bark are requisite for

the same results, but the tannic principles of both are not identical. The bark of the black wattle varies in its contents of tannin from thirty to forty per cent in bark artificially dried. But in the mercantile bark the percentage is somewhat less, according to its state of dryness, it retaining about ten per cent moisture. From some experiments made by Von Mueller, of Melbourne, it appears that no appreciable difference exists in the percentage of tannin in wattle bark, whether obtained in the dry or in the wet season. The bark improves by age and desiccation and yields about forty per cent of cutch, slightly more than one-half of which is tannic acid.

With ferric salts the tannin of the black wattle yields a gray precipitate and with ferrous salts a violet color is produced. By means of concentrated sulphuric acid the tannin is completely thrown down from a strong aqueous solution. When there is added to the boiling solution of mimosa tannin a minute quantity of bichromate of potash there results a ruby-red liquid suitable for dyeing purposes, and this solution yields black pigments when there is added the salts of sub-oxide of iron, but red-brown dyes are produced by the addition of the salts of the full oxide of iron.

More than half a century ago, in 1823, there was shipped to London a fluid extract of wattle bark which was sold there for the extraordinary price of $250 per ton, one ton of bark yielding four cwt. of extract of tar consistence, thus greatly economizing in freight and cartage.

There are numerous methods of obtaining the tanning extract from the bark. One process consists in subjecting the bark to hydraulic pressure and evaporating the strong liquid thus obtained in wide pans under steam heat. Or a preferable plan which prevents decomposition of the tannic acid is to effect the evaporation under a strong current of cold air. The evaporation of the infusion for cutch or terra japonica is carefully produced by means of gentle heat.

An expeditious method of estimating the tannic acid in acacia bark consists in filtering the aqueous decoction of the bark after cooling and afterward evaporating the solution, and then redissolving the residue in alcohol and determining the weight of the tannic principle obtained by evaporating the filtered alcoholic solution to perfect dr ess.

Acacia dealbata is commonly known among the colonists of Australia as silver wattle and its bark is much thinner and greatly inferior in quality to that of the black wattle, yielding only about one-half the quantity of tannin. The bark of the silver wattle is chiefly employed for tanning light and medium leathers, such as those produced from kangaroo skins, etc.

A TALLOW TREE.

This remarkable tree is a native of China. In the island of Chusan quantities of oil and tallow are extracted from its fruit, which is gathered when the tree has lost its leaves. The twigs bearing the fruit are cut down and carried to a farmhouse, where the seed is stripped off and put into a wooden cylindrical box, open at one end and pierced with holes at the opposite one. The box is then suspended in a cylindrical kettle containing water, and the diameter of which differs but little from that of the box. The water is then made to boil, and the steam, penetrating into the box, softens the seeds and facilitates the separation of the tallow. After about a quarter of an hour's exposure to steam the seeds are poured into a stone mortar, where they are stirred about until all the tallow has been separated in a semi-liquid state. It is afterwards poured into a cylinder with a hole at the bottom, through which it is driven by the action of a press. It comes out perfectly white, free from all impurities, and soon becomes solid.

LEATHER BELTING.

The belting industry is becoming more and more intimately associated with tanning processes every year, so much so, in fact, that many of the larger tanneries have introduced under the supervision of practical mechanics, a department especially devoted to belts. Ordinary leather, however, as made in the small country tanneries, is not particularly fit for heavy belting, and many users of belts complain of their belts doing poor service, when the principal difficulty is their own ignorance regarding the making and management, and care of belts. Every concern using belts, or, in fact, any means of power transmission to any considerable extent, should be started under the direction of a competent engineer, even though the knowledge may cost considerable, with very few exceptions the investment will be found a paying one. The writer of this article has never known a prosperous establishment started that had ample provisions made for scarcely a horse-power in ad-

dition to the original plan, and in the great majority of instances belts and gearings are figured to their maximum capacity with minimum motion, whereas the terms should be reversed; for after the buildings are erected, power and machinery placed in position, generally about the second thing to do is to hitch on another machine, when, if provisions are not made for their increased demands, some parts will be subjected to too great a strain for effective service, and the belts generally come in for more than their share.

Mr. Arnold in his "Mechanical Principa," has given some valuable data on the velocity and driving power of belts which are reproduced below.

REVOLUTION OF SHAFT.	DIAMETER DRUM.						
	2	2½	3	3½	4	4½	5½
100	628	785	942	1,099	1,256	1,413	1,727
110	690	863	1,036	1,208	1,381	1,554	1,899
120	753	942	1,130	1,318	1,507	1,695	2,072
130	816	1,020	1,224	1,428	1,632	1,836	2,245
140	879	1,099	1,318	1,538	1,758	1,978	2,417
150	942	1,177	1,413	1,648	1,884	2,119	2,590
160	1,004	1,256	1,507	1,758	2,009	2,260	2,763
170	1,067	1,334	1,601	1,868	2,135	2,402	2,935
180	1,130	1,413	1,695	1,978	2,260	2,543	3,108
190	1,193	1,491	1,789	2,088	2,386	2,684	3,281
200	1,256	1,570	1,884	2,198	2,512	2,826	3,454

The foregoing table shows the velocity of belts. The column headed "Revolution of shaft" shows the number of revolutions which the line or driven shaft is supposed to make per minute. The part marked "Diameter drum" shows the diameter of the drum on the line of the driven shaft.

Should it be desired to illustrate, the following will serve as an example: The line shaft is required to make 120 turns per minute, and it is desired the belt should run 1,800 feet per minute; required the diameter of the drum needed, merely find 120 in the column marked revolutions of shaft, opposite to this number in the table find 1,800, or the nearest number to it, which is 1,884 feet. Over this number in the column marked diameter drum will be found the diameter of the drum required.

CHAPTER XVI.

SIMPLE INTEREST RULES.

Four Per Cent.—Multiply the principal by the number of days to run; separate the right hand figure from the product and divide by nine.

Five Per Cent.—Multiply by number of days and divide by seventy-two.

Six Per Cent.—Multiply by number of days; separate right hand figure, and divide by six.

Seven and Three-Tenths Per Cent.—Multiply by number of days; and double the amount so obtained. On one hundred dollars the interest is just two cents per day.

Eight Per Cent.—Multiply by number of days, and divide by forty-five.

Nine Per Cent.—Multiply by number of days; separate right hand figure and divide by four.

Ten Per Cent.—Multiply by number of days; and divide by thirty-six.

Twelve Per Cent.—Multiply by number of days; separate right hand figure, and divide by three.

FACTS WORTH KNOWING

A cubic is two feet.
A pace is three feet.
A fathom is six feet.
A span is ten and seven-eighths inches.
A palm is three inches.
A great cubic is eleven feet.
A league is three miles.
There are 2,750 languages.
America was discovered in 1492.
Two persons die every second.
Sound moves 743 miles per hour.
A square mile contains 640 acres.
Envelopes were first used in 1839.
A storm blows thirty-six miles per hour.

A hand, horse measure, is four inches.

The average human life is thirty-one years.

An acre contains 4,840 square yards.

The first iron steamship was built in 1830.

Gold was discovered in California in 1848.

The first horse railroad was built in 1826-27.

The first lucifer match was made in 1829.

A hurrican moves eighty miles per hour.

A rifle ball moves one thousand miles per hour.

Electricity moves 288,000 miles per hour.

A mile is 5,280 feet, or 1,760 yards in length.

The first steamboat plied the Hudson in 1807.

The first use of a locomotive in this country was in 1829.

The first almanac was printed by George VanPurbach in 1640.

The first steam engine on the continent was brought from England in 1753.

Kerosene was first used for lighting purposes in 1826.

The first newspaper was published in England in 1588.

The first newspaper advertisement appeared in 1652.

Albert Durer gave the world a prophecy of future wood engraving in 1527.

Measure two hundred and nine feet on each side and you have a square acre within an inch.

The first complete sewing machine was patented by Elias Howe, Jr., in 1846.

The present national colors of the United States were not adopted by congress until 1777.

TAWING MIXTURE FOR GLOVE LEATHER, CALF, BUCKSKINS, ETC.

This process relates to a mixture for tanning glove leather, calf, or buckskins, and other skins and hides, which mixture is composed of the ingredients to be stated and mixed together in and about the following proportions: seven pounds of alum, three pounds of glauber salt (refined), four pounds of rock salt, ten gallons of soft water, five pounds of ground sumac, three pounds of oak bark, one pound of ground nutgalls, four ounces of oil of vitriol.

The alum, glauber salt, and rock salt, in or about the proportions named, are first reduced to a fine powder by pounding, or grinding, or in any other suitable manner, and then afterwards boiled in the ten gallons, more or less, of soft water, in a brass,

copper, or other suitable kettle. The sumac, oak bark and nut-galls are then mixed together and boiled briskly for twenty minutes, more or less; then such mixture while hot is strained in any suitable manner over the alum and salts mixed together as has been stated; the four ounces of the oil of vitriol are then added, the stirring being continued constantly until all are fully dissolved. In the liquid mixture produced from the ingredients mixed together in or about the proportions stated, place the skins to be tanned while such liquid is at blood heat, or nearly so, stirring them constantly for about one hour, after which "crowd" them down, so that they will be entirely covered by the liquid, where let them remain for about twenty-four hours, more or less. The skins are then ready to be removed, and being allowed to drip, they are set out upon both sides, using a glass slicker for the grain side. A heavy coat of lard oil is then applied to both sides; then, hanging the skins on hooks in a warm place, they are allowed to dry, thus completing the tanning. With a tanning mixture composed of the ingredients named, skins it is claimed can be tanned quicker than by any other mixture used, and in such a manner as to be ready to receive any color desired, be it scarlet, purple, or black, those named being most employed. If the skin is to be colored black, nothing more is needed beyond the tanning except something suitable for settling the color to make it permanent. The tawing mixture embraced in this process possesses, it is claimed, an advantage over other methods of tawing in these particulars more especially, that the color will not fade, even if exposed to the sun, that leather can be tanned by it in the quickest and cheapest manner possible, rendering it impervious to moisture.

THE USE OF CARBOLIC AND SULPHURIC ACID IN TANNING.

Carbolic acid is not used in the process of tanning. It is used as a disinfectant and for the preservation of hides; and where animals have died from contagious diseases a solution is made by handlers as a wash against infection. It is also used as a bate for the purpose of neutralizing the lime, the principal ingredients used being carbolic acid, muriate of ammonia and alum. This is an invention of one Parkins, and the solution is made as follows: Three-fourths pound of carbolic acid, six pounds of muriate of ammonia (sal ammoniac), and six pounds of alum, dissolved in one hundred and fifty gallons of water; but these proportions may be varied to conform to the experience of those using this compound.

It is claimed that hides and skins, after unhaired and run in the wash wheel and allowed to remain in this solution for twenty-four hours, it will entirely remove the remaining particles of lime within the pores, so that the tanning will be more readily absorbed and in the finish produce plumper and more pliable leather. The same manipulations are required in the handling and beaming, as where hen manure is used for neutralizing and depleting the hide. The process seems very simple and feasible. Hen and pigeon manure are employed chiefly for the properties of ammonia they contain, and the sooner some substitute be used to take the place of these objectionable relics of by-gone ages, the sooner will the tanneries become sweet-smelling institutions, wherein one may work without fear of being ostracized by his most intimate friends engaged in other pursuits. Sulphuric acid (vitirol) and acetic acids are extensively used for the plumping of sole leather hides previous to their being immersed in tannic acid, but we know of no method where carbolic acid is used other than in the preservation and depleting of hides.

RAW-HIDE BELTING.

This process relates to a mode of making belting for machinery; and consists in preparing and curing hides without tanning.

The belting made by this process of treating hides, it is claimed possesses great strength, and the time required for the manufacture does not exceed one month, instead of six or eight months required for tanning. The process is also cheaper than that of tanning leather belting. It is claimed that the belting produced by this process stretches less than either leather or rubber belting, and that it works with more regularity and uniformity on the pulleys, and wears much longer.

The method of preparing and curing the hides to manufacture the raw-hide belting is as follows: First, the hide must be dried by what is termed the "Indian process," without the use of salt, and by a free exposure to the air, so that it shall not undergo any putrefaction before it is thoroughly dried; second, the dry hide is then soaked for ten or fifteen days in rain water or other pure soft water; third, the hair is then taken off mechanically with a proper knife; fourth, the hide is then carefully stretched and smoothed on the side of a building, or on suitable frames, with great force, to extend it in all directions as tight as possible, and it is then thoroughly dried in the shade while in this position; fifth, after

being dried, a composition of oil and tallow is applied by rubbing it into the hide thoroughly to soften and render it more pliant.

After this treatment the hide is ready for use as belting, and is divided into strips of suitable width, which may be coupled together with rivets, in the usual way.

It will be observed that the hide is not allowed to ferment or putrefy, is not treated with alkali or acid, or any other chemical, nor charged with tannin, so that it retains all its gelatinous substance and fibrous tissue unimpaired, and is not deprived of any of its natural strength and tenacity, only the hair and excess of flesh on the inside of the hide being removed by the operation of currying with a proper shaving knife.

It is claimed that experiments made with this raw-hide belting show that its texture or body is very compact, even, and solid, and possesses immense power of resistance to strain or abrasion—qualities essential in belting for machinery.

A PROCESS FOR TANNING SUITABLE FOR USE ON THE FARM.

The hide or skin to be tanned is soaked in water until softened. If it is to be tanned with the hair on, it is next fleshed and passed into a vessel filled with a solution composed as follows: One-half barrel of water (hard or soft), eight pounds common salt, and six and a half pounds of sulphuric acid. The salt is dissolved in warm water, and then the salt thus dissolved with the acid is poured into the barrel containing the water, and the mixture thoroughly stirred before placing the hide in it.

If it is desired to tan the hide or skin with the hair off, it is first passed into lime, and when well limed and reduced it is placed in the solution described.

The skin or hide should remain in this solution from six hours to two weeks, according to the size and thickness. After the hide or skin has remained in this solutiun the proper length of time, it is taken out and rinsed in water, and scoured with a stiff brush, removing all salt and acid.

After this apply to the hide a solution of tan liquor, composed as follows: Lye made from elm, oak, or cotton-wood ashes, one gallon; tanner's oil, one gallon; neat's-foot oil, one gallon, the several ingredients being placed together in a vessel and well beaten up for half an hour. A heavy coating of this solution is applied to the hide or skin with a stiff brush, and then the hide or skin is hung out to dry.

After this take lye which is made of elm, oak or cotton-wood ashes, and reduce it so that it will not stain or color the hide, and sponge it, giving it three coats, one after the other, rolling the hide or skin up after each of the first two coats.

After the third coat oil must be applied while the hide is damp, and rubbed in with a stiff brush. It is then hung up to dry. The hide, after this, is ready for finishing.

By the first solution the gluten of the hide is (as the inventors term it) "crystallized," and the second solution relaxes the crystals, filling the hide, giving body and weight to the leather.

QUICK METHOD OF TANNING LEATHER.

The process relates to a quick method of tanning leather, and to the combination therewith of means for hardening and for preserving the leather.

This invention consists primarily in the employment of hard hack (*spirea salicifolia*) in combination with sumac, catechu and glauber salts, when used together in the manner and proportions to be described; also in combining borax with these ingredients for the purpose of hardening sole leather; also, in combining with the same, or other tanning composition, arsenic or an arsenical solution, for the purpose of preserving the leather.

The procedure is as follows, supposing fifty skins to be the number to be tanned: To twenty-five gallons of water add twenty-five pounds of hard hack, and boil the infusion till the essential principles of the hard hack are well extracted; then add to this solution or extract ten pounds of sumac, boiling the mixture or not, as may be deemed advisable. To this mixture add gradually fifteen pounds of cutch and twelve pounds of glauber salts (the latter previously dissolved in water). Into the vat that contains this mixture enter the fifty skins to be tanned, handling as usual, the cutch being gradually introduced, so as not to operate at once upon the skins with its full strength. Light skins are allowed to remain in this solution one to ten days, according to quality of stock; wax stock is to be left in eight to ten days; sole leather, thirty to forty days. The addition of the hard hack to the other ingredients, the whole being used in the proportions, substantially as described, it is claimed, imparts a softness and plumpness to the skins not otherwise attainable. In tanning sole leather, if to this solution be added one pound of borax, the result, it is stated, will be a material hardening of the body of the leather.

while the surface remains soft and smooth; and by adding a half pound of arsenic (previously dissolved), the quality of leather for durability is said to be greatly increased, the arsenical solution penetrating the leather throughout and preserving it in a pliable and soft condition until it is worn through by abrasion.

REMOVING ACIDS FROM LEATHER.

Various methods have been invented for neutralizing the acids which remain in hides after they have been tanned. A simple compound for this purpose is prepared as follows: Take three pounds of bicarbonate of soda and one pound of common salt, and dissolve them in about forty gallons of, preferably, soft water. After the ingredients have been thoroughly mixed, immerse therein one or more hides, and continue the immersion as long as any bubbles rise to the surface of the liquid.

This steep for the previously-tanned hides is stated to be eminently successful in eliminating all the adhering acid, and that, too, whether the ordinary tannic acid from bark, or that prepared in any way from other material, is employed.

ARTIFICIAL LEATHER.

Germany is now making artificial leather. Pieces of leather are washed, cut, boiled in alkaline lye, torn, neutralized with hydrochloric acid, and washed once more to remove all traces of acid. To this is added five to ten per cent of sinews, which are treated similarly, and steamed in an acid bath until they are somewhat like glue. The materials are then mixed, pressed into sheets, moistened on both sides with a concentrated solution of alum, and the upper surface receives a thin coat of caoutchouc in solution with carbon bisulphide.

EXTRACT TANNING.

The production of good leather at low cost has become a most important question, and there is little doubt that the use of the most approved extracts tends to cheapen the cost of tanning. I have twice tested this, and found the cost equal to only 2d. per lb. The advantage is chiefly that you just take from the cask what is required to strengthen your liquors, and there is no waste or evaporation as there is in making liquors in open pits, where the variable temperature affects the process unfavorably.

It is not easy to test the relative values of extracts; the barkometer is useless. The only proper way is to take, say two hun-

dred hides, and after fleshing them, to divide the pelt equally; to use one kind of extract with one, and another extract with the other half. I once made such a test, and found that one extract was 25 per cent cheaper than another—i. e., three casks did the same execution as four casks. The reason was apparent. When liquor was pumped out, I found where we had used four casks the sediment was more than double that of the three casks, proving that the latter was more clarified.

One of the great advantages in the use of extracts, as well as the saving in cost, is the saving of space. In erecting new premises, most of the room occupied in old yards with large bark barns, and taps or leaches, could be dispensed with, as well as the labor required to constantly pump round the liquors in the taps and handlers, which in hot weather, when the expenditure is rapid, must be continuous. Mark again the disadvantage during cold and frosty weather of making and pumping round the liquors. No wonder the process is so slow under the old system, as the operation must be greatly retarded by the exposure of the liquor to the cold atmosphere.

HIDES OF FARM-SLAUGHTERED ANIMALS.

The hides of farm-slaughtered animals have a poor reputation, because of the careless way in which they are stripped. Calfskins and sheep pelts are ruined one-half in value by being cut and gashed, and improperly stretched. When a hide is stripped off, it should be stretched at once, and pegged out to dry, with the flesh side upward. If it is rolled up, or thrown in a heap and left to dry in that shape, it is so mean looking that a buyer will offer only half its real value. A few hints in regard to taking off a hide, may be useful. The throat should never be slit crosswise, either in killing or taking off a hide. The skin is slit from the chin down the brisket, in a straight line to the tail; it is then cut around each hoof; the hind legs are slit behind over the gambrel, but the front legs are slit up in front, over the knee. This leaves the skin in good shape for finishing the leather. The head and legs are first carefully skinned, and all cutting the skin is avoided. The skin is then easily drawn off by taking hold of it firmly, and pulling it steadily. It is then spread out evenly on a floor, and salted with fine salt. If there is but one it is best to stake it out as soon as the salt has taken, and dry at once in a cool, shaded place. If there

are more than one, they are laid upon each other and salted quite freely, and afterwards they are thoroughly dried. If the skins are kept on hand, they should be closely watched for moths or grubs.

THE WEIGHTING OF LEATHER.

Under the above heading we are desirous of saying a few words in reference to the methods and substances used to increase the weight of soling leather in tanning. It is needless to say that these substances are solely used with the intention of taking advantage of the consumer. This has been thoroughly demonstrated by Mr. Eitner, the well-known expert, who has a laboratory for chemical and technical experiments for the leather industry in Vienna.

We gather from the experiments made by him that leathers have been placed on the market containing large quantities of foreign matter, viz., sulphate of baryta. This product is formed from chloride of barium and sulphuric acid. Among other things, Mr. Eitner says: "If these matters are added, and it is very probable they are, during the process of tanning, the latter process is carried out very inefficiently. Neither of the two substances have any tanning properties whatsoever, nor have they any advantage for tanning purposes. They are used solely as an absorbent for the purpose of increasing the weight of the leather. The increase of weight is, after all, a delusion, for such increase is only to a very limited extent. The substances are only absorbed to some extent, for in the center of the leather very little is found.

"If the sulphate of baryta cannot be washed out it may be detected by analysis, and even by the shoemaker. The substance mentioned can only be intended to be used for fraudulent purposes and for no other. Chloride of barium is a very poisonous substance, and several blood-poisoning cases have already occurred by its use in tanning establishments, two of which have ended in death."—*Shoe and Leather Trades Chronicle.*

White birch-bark oil, which gives to Russia leather its peculiar aromatic and lasting qualities, when dissolved in alcohol, is said to be excellent for preserving and water-proofing fabrics. It renders them acid and insect-proof, and does not destroy the pliability of the fabric.

A leather varnish or polish, said to be of peculiar adaptation, is

prepared at Gunther's establishment, Berlin, by mixing a filtered solution of eighty parts of shellac in fifteen parts of alcohol, with three parts of wax, two of castor oil, and a sufficient quantity of pigment; this mixture being evaporated in a vacuum to a syrup. The varnish is applied to the leather with a brush moistened with alcohol.

The porpoise skin, from which shoes are now made, after being cleansed of the blubber, is ready for the tanner, and they readily bring $5 each. Out of porpoise hide very fine leather is made, a quality that takes color nicely, dresses beautifully and is employed in making some of the finest novelties.

ART IN OILING SHOES.

A one-armed bootblack having taken the contract to oil the shoes of a reporter, after the preliminary brushing, began by rubbing the leather with a wet cloth. When asked what it was for he explained: "When I began this business," said the operator, "I used to keep on rubbing the oil into the leather until a man told me to stop. I thought they'd know when they had enough, and I wanted to give satisfaction. Some of my customers complained that the oil soaked through their boots and saturated their socks. I thought perhaps I had been putting on too much oil, but the same fault was found in several cases where I had been more careful. Finally an old shoemaker, whom I knew, came along, and I asked him what I ought to do to save my trade. He told me never to oil a shoe until I had wet it first. The reason was that the water would penetrate the leather and, remaining there, keep the oil from soaking through. Besides, the water would soften the leather and open it so that the oil would do the leather more good. My trade has prospered ever since."

SHAGRIN LEATHER.

This leather is chiefly celebrated for its hardness and strength, and for the peculiarity of its grain side, which appears as if covered with globular granules. It is of Eastern origin. The best shagrin is now made in Persia, Constantinople, Algiers and Tripoli. The production of the small globular granules on the grain side was for a long time kept secret. We were first informed, years since, by the celebrated traveler, Pallas, that they were produced by stamping the seeds of the wild orach into the hide, spread on the ground. The seeds were afterwards knocked out and the

hide scraped on the indented side, and soaked in water for two days. There is another description of shagrin, totally different, made from fish-skin, called fish-skin shagrin. It is used for covers, wood polishing, etc.

TANNING HIDES AND SKINS WITH THE HAIR ON.

The following is a convenient method by which farmers and others may tan hides and dress furs as their requirements may demand. The tanning composition consists of new milk, one quart; wheat flour, one quart; barley meal, half pint; oatmeal, one-half pint; cornmeal, one pint; sal soda, one ounce; cream of tartar, one ounce; salt, one pint; oil of vitriol, one ounce. The above named ingredients are carefully and thoroughly mixed into a paste, having the consistency of white lead. The hides to be dressed for furs, after being soaked and fleshed, are spread upon a flat table or bench, with the flesh side up, after which the paste is spread to the thickness of about one-eighth of an inch upon the flesh side, and allowed to dry while it is spread out. When the hide has been allowed to become sufficiently dry, it is removed from the stretcher, "worked over a beam" with a flesh knife until it is quite soft, and in condition for use.

ABOUT SUMAC.

Mr. Ed. Voerster, in the New Orleans *Times-Democrat*, says that sumac grows wild and luxuriantly as far north as Kentucky and Virginia. In Louisville, Ky., where I was interested in a tannery, we obtained our supplies (unground—in the dry leaf) from the surrounding country, paying from one to one and one-quarter cents per pound, we furnishing the sacks. Baltimore, Md., is a leading market for dried sumac in the leaf, and also the powdered.

If American sumac is ground or powdered, it enters into competition with Sicilian sumac, and here quality decides the market price. Sumac is a bleaching material for leather, to produce the fair leather color. The possibilities for the Louisiana product would be in ground sumac packed in hard-pressed bales or sacks, in which state it would doubtless go at cotton freight rates. For an experiment the question would be, can it be got dry enough for grinding? Will it bring a higher price than the Virginia article? A few hundred pounds of air-dried leaves pressed in sacks might be sent to Baltimore, Boston, or to some fine, fair-leather manufacturer in the East for a trial.

We believe that Southern grown sumac is considered superior

to the best Sicilian, as it is richer in tannin. The latter, however, generally brings a better price, owing to more careful gathering and method of preparation.

COLORING FURS.

After the skins have been tanned as above directed and dried, in order to color the furs, soak the skins until they become soft, and then wash them in a moderately strong solution of sal-soda in water, and then rinse them until they are clean; then apply with a brush, and rub well through the fur down to the pelt, half an ounce of crystallized nitrate of silver, and one pint of soft water, and hang in the sun to dry. After being dried apply with a brush, and rub well through the fur, one ounce of sulphate of potash dissolved in one pint of soft water, and then hang the skins in the sun to dry, and when dry, rinse off, and then hang in the shade to dry; and during the final drying the skins should be occasionally worked, in order to soften them. For coloring the furs black, the following ingredients may be employed: Nitrate of silver, one ounce; antimony, one ounce; gunpowder, one pint; water, about one pint. The liquid prepared as above is applied to the fur with a brush, and afterward rubbed until dry, which completes the process.

A "FORGOTTEN" COLOR FOR GLAZED LEATHER.

The simple decoction of onion-peel communicates to glazed leather a very beautiful orange yellow. As a mixing color with the bright dark colors, especially willow bark, it furnishes the most delicate light tints, adding also a particular gloss and fire. Used as a yellow pigment for all brown shades, these are rendered brighter and more expressive. It also readily seizes upon those leathers which are difficult to color, and covers them well and equally.

CONSTITUENTS OF HIDES.

The following is contributed to *Leather*, by C. R.:

"The text books on tanning have given very full and explicit descriptions of the construction of the hide, but, to my mind, they have not entered sufficiently into certain details, showing its duties, offices and the share which it takes in the animal economy. A healthy skin is as necessary to life as the food which is eaten, and part of that food is consumed by the skin for its proper maintenance and distribution. A healthy skin is soft, flexible and porous, and

in this state will show the healthy and good condition of the owner. On the other hand, a hot, tight, rigid one will prove the contrary, showing that the duties which it ought to perform and the exudations which should be discharged are in abeyance. The experience of every tanner shows this: That with a hide in a healthy condition and from a well-fed beast, he can make the best of leather, while with the ill-doing thing—not to go to extremes and say blood bound one—he can make nothing satisfactory. Therefore, an open, porous skin is necessary to life, and the contrary leads to death, as was proved in the case of the poor boy, who was covered with gold as a spectacle in a procession, who died because of the inability of nature to find relief in sweat. Therefore, as this sweat must exude from the hide there must naturally be in this source and fountain always a stock on hand. On this I wish to make some practical remarks. First, to show how an effort has been made to remove this fat and at the same time show the advantage of its removal. It is admitted on all hands that the American tanners, by their system of cool sweating, do get very extraordinary weights, and that the cool sweat-house is a most pestiferous place from the overpowering effects of the ammonia produced. This ammonia cannot all be caused by the destruction of pelt or the damage would be simply enormous. Therefore, in questioning how it does arise is it not reasonable to suppose that it is from the fatty matter, which contains the sweat or produces it? And when we know that this fatty matter is asserted, on high authority, to be more than one fourth of the weight of the hide this hypothesis does not seem either unreasonable or far-fetched. Then upon this fatty matter being got rid of tannin can take its place, and this, in my opinion, is the cause of the superior weight of sweated leather. Assuming this, it is fair to conclude that everything in the manufactories ought to be eliminated and the fibre and gelatine (as the only parts that tan) left in their pure and free state to absorb the tannin. If lime could kill or remove this fat, the same weights would be made as are obtained from the cool sweat. With lime we make a dry Cape hide of sixteen pounds into twenty-one pounds of leather, but with the cool sweating process a weight is claimed of twenty-nine pounds. It can be proved that such a result has been attained here by removing this fat, and the experiment of Muntz and Schon even goes further and shows a gain of eighty-eight per cent. Science will eventually be carried far enough to prove what ultimately

becomes of this fat, whether it remains in a quiescent neutral state or is killed by the tannic acid. But, until it is removed, it is certain that all is not made of the hide that should be.

TRANSPARENT LEATHER.

This leather is made by a patent process. The skins are depilated, cleansed, and stretched over frames, and the following mixture is rubbed into them: One thousand parts of glycerine at twenty-six degrees, two parts of salicylic acid, two parts of picric acid, and twenty-five parts of boracic acid. Before the skins are perfectly dry, they are introduced into a chamber sheltered from the light of the sun, and they are made to absorb a solution of bichromate of potash; and after they are thoroughly dried, they are then covered with an alcoholic solution of shellac, and transparent leather is formed. It is very tough, and makes excellent straps.

LIGHT-GRAY COLOR FOR DYEING KID.

The problem of preparing a fine, uniform, well-covered, light-gray color suitable for dyeing kid is one of the most difficult tasks. The following is a preparation prepared by a well known chemist, after a prolonged study, which mixture is well recommended by those who have tried it.

It is composed of the following constituents: 1⅜ pounds of alder bark are boiled out with 1⅝ gallons of water; finally the evaporated water is replaced and the mixture is made up to 1⅝ gallons; 2½ ounces of fustic are boiled in three pints of water, and the evaporated water replaced and the mixture made up to three pints; the two mixtures thus prepared are mixed together, diluted with 1¾ gallons of water, and finally the compound is treated with "ligustrum-juice." Four coats of this mixture are required. A solution of ⅝ pound ferrous sulphate in 37½ gallons of water is then applied.

NEW SUBSTITUTE FOR LEATHER.

Dr. Geo. Tenius, in Vienna, has a process for the manufacture of artificial leather from red beechwood. The best wood for the purpose is taken from fifty to sixty-year old trees, cut in the spring, and must be worked up immediately—bark peeled off, steamed, treated with chemicals in a kettle under pressure, and then exposed to several more operations, which the inventor does not mention, as he wants to have them patented. From the prepared wood strong and thin pieces are made by means of heavy pressure. The inventor

states that a solid sole leather can be obtained, which he claims is superior to the animal leather in firmness and durability, and can be worked up in the same way as animal leather, nailed and sewed.

COLORED LEATHER.

Modern leather manufacturers are surpassing the ancients in the diversity and beauty of the colors they are introducing. Many of the shades produced in upper leather are highly attractive. The Thebans were thought to have attained great proficiency in this art, but the variety of colors they are credited with was meager comprred with the iridescent display of our epoch. Remnants of leather found in Theban tombs reveal the use of acacia and other trees in the tanning process. The Jews, after the exodus, probably put into practice the knowledge obtained of this art under the Pharaohs, in preparing rams' skins dyed red for the service of the tabernacle.

The love of colors is as old as the human race. The art of dyeing leather, so long practiced on the Mediterranean, was afterward attained with difficulty by other European countries. But we need no longer go to Egypt or the Mediterranean for instruction concerning it.

GLUCOSE IN LEATHER.

The falsification of the weight of leather by adding glucose, or grape sugar, appears to have been carried on rather extensively in Germany, and the shoe trade societies took steps to protect themselves from the imposition. A simple test is recommended, which consists in placing pieces of the leather in water for the space of twenty-four hours, when the glucose will be dissolved by the water, and the result will be a thick, syrupy liquid. When two pieces of the leather are placed together and left in that position for a time, it will be found difficult to separate them, as the gummy exudations will stick them together. It is stated that some samples of sole leather were found to contain as high as thirty to forty per cent of extra weight. Another test recommended, is to cut off small pieces of the leather, and wrapping them up in a damp cloth, lay them away for a few days in a temperate place. If the leather is adulterated, the pieces will be found to be stuck together, and surrounded by a syrupy substance, in proportion to the quantity of the adulterant used; and the peculiarity about leather treated with grape sugar is, that after wetting, it is difficult to dry, and resem-

bles gutta percha, or untanned leather, more than the genuine article.

SOFTENING LEATHER.

Neatsfoot oil will not soften leather under all circumstances; neither is castor oil any better. Oil is not necessary to the pliability of leather—the leather of the ox, goat, calf and kid. It is necessary that the leather be kept moist; but oil need not be the moistening means. Yet in use, oil is the most convenient means for keeping leather soft. It would be inconvenient to employ water to keep pliable the leather of our boots, because of its spreading the pores of the leather and admitting cold air; besides, unless always wet, leather becomes hard and rigid. Oil, on the contrary, keeps the leather in a proper state for its best usefulness, that of pliability. But in order that oil may soften the leather, its way should be prepared by a thorough wetting of the leather by water. Much less oil is required if the leather is well saturated with water. The philosophy is obvious; water is repellent to the oil, and prevents it from passing entirely through the leather, holding the oil in the substance of the leather. The use of water for softening belts in factories is not inconvenient, if advantage is taken of a holiday. At night the belts may be brushed clean and thoroughly wetted; then in the morning use the oil; a much smaller quantity is necessary to render the belt pliable than when no water is used.

UNPREPARED INDIAN HIDES.

It is well known, says an exchange, that the North American tanners use a large number of Indian hides. These hides weigh, on an average, ten pounds. The buyers in the United States discovered at one time that this was too light a weight, and consequently, when they gave their orders, made it a condition that they would only receive hides weighing at least fourteen pounds. In order to fulfill the requirements of the North American tanners, the inhabitants of India found a means of artificially increasing the weight of the hides, by smearing them with several coats of a mixture of saltpetre, salt, and lime, known by the name of "chenam." This deceitful practice is universal in India, and has caused considerable losses to tanners in all parts of the world. Not only, however, does the employment of "chenam" increase the price by some forty per cent, but in addition to this, extra freight has to be paid for this false weight. In former times, tanners produced from every 100 pounds of Indian hides, from 135 to 145 pounds of

leather, but now they get only about ninety-seven pounds. All the efforts made hitherto to root out this dishonest dealing in India, have remained without result.

ANOTHER METHOD OF TANNING.

Cassel's Magazine refers to a process of tanning with soap, as follows: "A method of tanning with oil, soap and carbolic acid, is stated to have been brought out by an Australian inventor. The skins, after being limed in the ordinary way, are placed in a bath, consisting of a mixture of ten gallons of water, in which 200 pounds of soap are dissolved, and containing one gallon of carbolic acid. The skins are left in this until converted into leather. The process, is said to be accelerated by adding a fresh pint of carbolic acid to the liquor from time to time. The above course is applicable to sole leather; but for a softer leather, limed and unhaired skins are kept for one or two days in a mixture of four parts of carbon bisulphide and one of carbolic acid, and then washed."—*London Leather.*

TANNING WITH OFFAL.

For years subsequent to the introduction of gas made from the destructive distillation of coal, there was no little difficulty in getting rid of the by-products of the process, but with the advent of processes for recovering the aniline found in the heavier products-the use of the ammonia and potash liquors by the fertilizer manufactories, together with other uses of the crude products, gas manufacturing companies made a specialty of storing the baser elements for market, and no little industry sprung up in the larger cities that engaged in the manipulation of refuse and waste from the gas works.

Investigating genius, however, would not allow the matter to rest here, but as a result of many wearisome tests and exhaustive experiments, we are now asked to adopt a new element in the tanning industry, nothing more nor less than a substance to supersede the bark liquors, and this substance is pyrofuxin, one of the many elements found in mineral coal. Prof. Reinsch, the discoverer and patentee, claims that subsequent to the contact of pyrofuxin with the skin, it rapidly unites with the tissues, so that, after a long soaking in water, the solid gelatine, the leather, is not decomposed, and the pyrofuxin is not extracted.

One very desirable feature set forth in his claims, is the rapidity of its action; this, as compared with the action of alum or tannic acid in the ordinary tannery process, is as one to fourteen for alum,

and one to twenty-eight for bark. To explain more fully, it takes fourteen times as long to tan with alum as with pyrofuxin, and twenty-eight times as long to tan with bark as with pyrofuxin. This feature will recommend itself to the attention of practiced men, from the fact that in all the processes of tanning one great drawback to profit is the great length of time capital remains idle for, by the time the green hide has undergone all the processes and reached the markets, the greater part of a year has expired.

Regarding the structure of the corium of this pyrofuxin tanned leather, it is finer in fiber, more closely interwoven, and shows a sharper delineation of the fiber than in leather made with alum or bark liquor. The epidermis is harder and more elastic, and is also stronger. Comparative experiments, made by weighing equal sized bands of leather, taken from like parts of sheepskins, alike in their raw state, yielded the following results, according to the published reports in a German paper.

Profuxin leather	. . . . .	20 pounds.
Alum "	. . . . .	7½ "
Bark "	. . . . .	5 "

As to the cost of this new material, it is now lower by at least 25 per cent. The dry substance is fine, non-triturable material, void of taste or smell, it is insoluble in water, non-poisonous, and resembles catechu very much; it is soluble in caustic, potash or soda.

In his letter the professor states that all the mineral coals do not yield this substance, but in found in rich abundance in the leaf coal of Central Russia, and in nearly all bituminous coal of the semi-block variety. Taken all in all this is a very important discovery, for any process that increases the durability of leather, diminishing the cost and time of production, is economical and increases the demand, making the inventor a benefactor.

LEATHER CANNON.

"Let me give you a bit of history," said a down-town leather merchant recently, "that many a student has overlooked. The objects of peace are not all that leather figures in, for it is to leather that we owe the introduction of light artillery. Leather cannon have been actually tried on the battlefield, and, what is more, turned the tide of one of the greatest battles of modern times. The inventor of leathern artillery was Col. Robert Scott, a Scotchman in the service of Charles I. of England.

"He constructed guns of hardened leather, and experimentally tried them. The result was that they were pronounced superior to guns made of brass or iron. The Colonel, however, did not live long enough to enjoy the greatest triumph of his invention. He died in 1631, and a monument erected to his memory I have seen in a church-yard in London. This monument represents him as an armor-clad, fierce-looking man, wearing a heavy mustache and a pointed beard."

In the very year of the Colonel's death the effectiveness of his leathern artillery was amply proved on the memorable field of Leipsic, where September 7, 1631, Gustavus Adolphus achieved his splendid victory over the Imperialists, under Gen. Tilly. It is said that it was owing to the invention of Col. Scott that the victory was obtained.

The guns were found to be so easily carried that a small battery could fly from one part of the field to another, and thus artillery be brought to bear when most needed, a thing impossible to the heavy cannon of that period. Certain it is that leathern artillery was used in this great battle by Adolphus, though it is equally certain that the guns were never used afterward. The reason of that, however, was that the leather guns having demonstrated the value of light artillery, a way was discovered of making the metal guns lighter, and the greater durability of the latter gave them the superiority.

As used in the battle of Leipsic, the leather gun consisted of a copper tube of thickness of parchment, strengthened by plates of iron running parallel with the gun, bound with iron bands. The tube was then bound with several coatings of cord, with a cement of mastic between each coating, and the whole inclosed in a case of tough leather. The weight of the gun was such that two men could easily carry it. The great Napoleon was not above using leather as a means of defense. He put the leather cuirass upon twelve regiments of his celebrated cavalry.—*New Orleans Times Democrat.*

VALUABLE INFORMATION.

WESTERN HEMLOCK.

The hemlock was formerly considered of little value in the Northwestern lumber regions, but as the supply of pine diminishes the lumbermen are finding, as the New England lumbermen did many years ago, that it is really a valuable tree. Thousands of acres of land from which the pine had been cleared have been allowed, it is said, to revert to the states for unpaid taxes, the owners believing that the trees were not worth the cutting. Michigan and Wisconsin possess millions of feet of this timber. Its use is becoming quite extensive, and the cut is rapidly increasing, especially in Wisconsin, where one county—Shawano—alone is said to have cut 20,000,000 feet annually. In the East hemlock has been found to be fully equal to white pine for many purposes, and an excellent substitute for other wood. As the supply of white pine in Michigan and the other Northwestern states continues to diminish, the use of hemlock in its place will naturally become very large, and the land so foolishly allowed to revert to the state for non-payment of taxes will in the future command good prices.

DISCOVERY OF A TANNERY FOUR HUNDRED YEARS OLD.

At Hamburg, Germany, some excavations for building purposes, a few years ago, brought to light a buried tannery supposed to be 400 years old, containing several pits, in which there were a large number of hides that have been there, it is estimated, 150 years. Among others there were found in one pit eighty-nine ox hides or sides which had been slaughtered in the town. The greater portion of these hides was bought by a Berlin firm and the remainder are to be completely tanned, as they were only partially finished. It is hoped that a well-tanned leather of a suitable color will be obtained. The hides are tolerably well preserved, notwithstanding the long time they have been in the pits, which, it appears, lacked tanning matter. They are, however, still quite moist and healthy and have a brown color.

FROZEN LEATHER.

It is well known to tanners that leather in the drying loft when exposed to cold will perceptibly lose in quality and weight. The cause has never been fully explained. Mr. V. Eitner, a Vienna scientist, has investigated the matter and the following is a very plausible theory which he propounds: "The water," he says, "which fills the pores and cells of the hides is transferred by frost into innumerable little crystals. These crystals will distend the cells and even tear many of them with their sharp edges, thereby reducing or destroying their faculty of retaining particles of water by capillary attraction. In consequence, when in warmer temperature, the icy crystals dissolve. The water, which otherwise would have remained in the tissues, flows freely out of the widened and broken cells, and not only the water, but along with it a good deal of tannin and other solid substances. This accounts for the loss of weight and consistency in leather on the same principle that holds good as to frozen fruit. When, for instance, a frozen apple is thawed up, the water oozing out from its pores will carry along part of the juice and thereby impair its volume and its flavor."

The writer, when serving an apprenticeship many years ago in the New England states, had his attention frequently called to the decided change in the plumpness and complexion of frozen leather from that which had been dried out without coming in contact with the frost. In the early days of the leather manufacture, tanneries were not equipped with all the more modern appliances in machinery or facilities for drying leather. Many of the yards were unprotected from the inclemency of the weather or the rigor of the seasons. Packs of leather not infrequently during the winter were frozen in the pits. When the leather was taken out to prepare it for splitting it was thrown upon fences or poles in the open air where it would freeze and thaw during the one or more days it was thus exposed for "hardening" it, a term used in the Eastern states when drying out a required percentage of the water before the leather could be satisfactorily skived and split. But in the West the word "sammied" is used in place of hardening. This latter term is a very appropriate one when leather is dried at a higher temperature or during the summer season, but the term "softening" would more aptly apply to leather thus frozen and thawed.

It was a common expression then among the old tanners that "One good freezing was equal to a layer of bark." But I hardly

believe that many of them then realized what a sacrifice they were making in order to kill the horn or untanned gelatine in the hide in the endeavor to force the leather on the market in a shorter time, and thus obviate the necessity of giving the leather another layer of bark, particularly when tanning for inner sole and sole leather purposes. Freezing is without doubt beneficial to some classes of skins wherein weight and close texture are not of much consideration, as in the case of sheepskins, skivers, linings and leather made from hard, tinny hides which cannot be brought to the desired suppleness in the beam-house. Yet it is a sacrifice of the gelatinous tissue, although the strength of the fiber is not impaired, but, on the contrary, leather frozen and thawed, though softer and of a more delicate complexion, has a greater tenacity of fiber

LIBRARY OF THE UNIVERSITY OF CALIFORNIA

CHAPTER XVII.

VALUABLE RECIPES.

GRAIN LEATHER DRESSING.

Take eight ounces of extract of logwood, one once of bi-carbonate of potassia, two ounces of prussiate of potassia. Dissolve logwood and potassia in eight quarts of soft water—condensed steam preferred. Boil until thoroughly dissolved, and when cool, strain off. To every gallon of the mixture, add one-half gallon of beef blood, or increase the blood according to the brightness of finish required.

IMITATION GOAT AND GLOVE BLACK.

Take seven pounds of copperas, three pounds of gambier, one ounce of powdered nut-galls. Dissolve in two gallons of hot soft water. Add forty gallons of soft water; stir, and it is ready for immediate use, and at a cost that will not exceed one cent per gallon.

BOOT GRAIN AND HARNESS BLACK.

Take nine pounds of copperas, one-fourth pound of epsom salts, six ounces of ascetic acid, and one ounce of powdered nut-galls. Dissolve in two gallons of hot soft water; then add forty gallons of soft water. It is equal to the best cider vinegar black, and at a cost of about one cent per gallon.

SCAR PASTE.

Take six ounces of granulated gelatine and dissolve in one quart of cold soft water; four ounces of extract of logwood, one-half ounce of bichromate of potassia, one-fourth ounce of carbonate of potassia, and one-eighth ounce of sulphate of copper. Dissolve logwood, potassia and copper in two quarts of hot water; then mix with the gelatine and stir until it begins to congeal. Apply with sponge to grain imperfections after the leather is blacked.

BOOT TOP LIQUID.

Oxalic acid, one ounce; white vitriol, one ounce; water, thirty ounces. Dissolve and apply with a sponge to the leather, which should have been previously washed with water. Then wash the composition off with water, and dry. This liquid is poisonous.

BLACK VARNISH.

To make a good black varnish for iron or other metals, dissolve by heat, three ounces of asphaltum, four quarts of boiled linseed oil, and eight ounces of burnt umber. Mix the compound with turpentine while cooling. This will be a valuable varnish on all iron work and on tools in and around a tannery.

TO PREVENT DEPOSITS OF LIME IN BOILERS.

Throw into the heater, or reservoir from which the boiler is fed, a quantity of crude hemlock, or oak bark in the original sheets, sufficient to turn the water to a brown color. If you have no tank, put into the boiler through the man-hole, several sheets, after blowing off, and continue every month, using only half the quantity after the first time.

Sal-soda is also a very effective agent for removing the scale in boilers. Put within the heater, or boiler, about ten pounds for an ordinary boiler, a few hours before blowing off. The inside shell will then have, when clean, the appearance of porcelain.

INK FOR MARKING PACKAGES.

Shellac, two ounces; borax, two ounces; water, twenty-five ounces; gum-arabic, two ounces; Venetian red, or lamp-black sufficient to color. Boil the borax and shellac in the water until they are dissolved, then add the gum-arabic and withdraw the mixture from the fire. When the solution has become cold, complete the twenty-five ounces by adding water and enough Venetian red to bring it to a suitable consistency and color. This ink must be preserved in a glass or earthenware vessel.

LIQUID SHOE BLACKING.

Ivory black, one pound; loaf sugar, four ounces; whites of six eggs; beer of sufficient quantity for diluting. Mix the whole well and let them simmer half an hour; then bottle for use.

CURRIERS' SOFT SOAP.

For wax upper leather and calfskin: Take sixty pounds of potash and dissolve it in an iron kettle, by steam. When fully dissolved, draw off into a pine butt, or hogshead; add eighty-five pounds of best tallow; apply steam and cook for ten to twelve hours, adding soft water at intervals until the mixture is of the desired consistency. The above ingredients will make from eighty-five to ninety gallons of soft soap.

HARNESS BLACKING.

Beeswax, three ounces; ivory black, four ounces; neatsfoot oil, one pint; castile soap, two ounces; lard, two ounces; aloes, one ounce. Boil together and put into a basin and cool.

INDIA RUBBER LIQUID BLACKING.

Ivory black, six pounds; treacle, four pounds; gum-arabic, dissolved in hot water, two ounces; vinegar, two gallons; sulphuric acid, two and one-half pounds; India-rubber, dissolved in about one pint of oil, two ounces. Mix well together. This blacking may be applied by means of a brush, or a small sponge attached to a piece of twisted wire.

CEMENT FOR LEATHER OR RUBBER SOLES AND LEATHER BELTING.

Gutta-percha, one pound; India rubber, four ounces; pitch, two ounces; shellac, one ounce; linseed oil, two ounces. Melt and use hot.

INDIA RUBBER WATER-PROOF COMPOSITION FOR BOOTS AND SHOES.

Spermaceti, four ounces; India rubber solution, one ounce. Melt with a gentle heat, and then add tallow or lard, ten ounces; copal varnish, five ounces. Mix well and apply the composition to the leather with a paint brush.

TO CLEAN BUFF COLORED LEATHER.

Oxalic acid, one ounce. Dissolve in one pint of water, and wash well; then rub in a little clean tallow.

FOR SOFTENING LEATHER.

Mix boiled linseed oil, one pint; beeswax, two ounces; Burgundy pitch, one ounce; turpentine, two ounces. Melt all the ingredients together, over a slow fire. The mixture should be well rubbed into the leather on both sides, but principally on the flesh side.

VARNISH FOR BOOTS AND SHOES.

Linseed oil, one pint; mutton suet, one-half pound; beeswax, one-half pound; small piece of rosin. Boil all these in an earthenware vessel, together, and use it when luke-warm, with a hair brush. Two applications will make the articles water-proof.

FOR CALF-KID AND PATENT LEATHER.

If calf-kid begins to look reddish and rusty, give it a slight application of oil, which will partially restore the color; if not, put

on blacking, and when dry brush off and go over again, with a a light dressing of oil, when it will be as good as new. Patent leather will not only be made softer by this treatment, but the lustre will be improved by oiling.

CLEANING MOROCCO LEATHER.

Set the skins well over a table, and scour them with a stiff brush, using tepid water and soft soap, made slightly acid as follows: Get a penny-worth of oxalic acid, and only use a fourth—which should be dissolved in two quarts of water; if any stronger it might take the color out. When done, take the skins from the table and dry them in a cool place; do not fully saturate the skins, and have the table on an incline. When dry, rub a little oil over the surface with a rag. If not particular about the color the following simple recipe will answer the purpose: Take the yolk of two eggs, and the white of one, also one tablespoonful of gin and sugar; then add a little ivory black. This will produce a fine black. Use as ordinary blacking.

TAWING SKINS.

Take nine gallons of water, nine ounces of alum, five ounces of saltpetre, and three and one-half ounces of chloride of sodium or common salt, subsequently pouring in nine ounces of carbolic acid, and thoroughly stirring the whole. Place in this mixture the skin to be dressed, as open as possible, and leave it in thirty-six hours, turning it about occasionally. When taken out the skin should be stretched on a board, and then allowed to dry in the sun or in a warm place. When dried, thoroughly rub it with pumice stone on the flesh.

TO PREPARE SHEEPSKINS FOR MATS.

Make a strong lather with soap and hot water, and let it stand until cold; wash the fresh skin in it, carefully squeezing out all the oil and dirt from the wool; wash in cold water until all the soap is taken out. Dissolve a pound each of salt and alum in two gallons of hot water, and then put the skin into a tub sufficiently large to cover it. Let it soak for twelve hours and hang it over a pole to drain. When well drained, stretch it carefully over a board frame to dry, and repeat the stretching several times while drying. Before it is quite dry, sprinkle on the flesh side one ounce of alum and one of saltpetre, rubbing them well into the flesh. Try the wool to see if it be firm on the skin; if it be not, let the mixture remain a day or two, and then rub again with alum; fold the flesh

side together and hang in the shade for two or three days, turning them over each day until quite dry. Scrape the flesh side with a blunt-edged knife, then rub with pumice or rotten stone. Fur skins are tanned by first removing all of the useless parts, and softening the skin by soaking in cold water, then remove the fatty matter from the flesh and soak in warm water for half an hour. Next mix equal parts of borax, saltpetre and sulphate of soda in the proportion of about one-half ounce each for each skin, with sufficient water to make a thin paste; spread this with a brush over each skin, applying more to the thicker parts than to the thinner; double the skin together, flesh side inwards, and place in a cool place. After remaining for twenty-four hours wash the skin clean, and apply in the same manner as before a mixture of one ounce of sal-soda, one-half ounce of borax, and two ounces of hard white soap, melted slowly together without being allowed to boil; fold together and put in a warm place for twenty-four hours. After this, dissolve four ounces of alum, eight ounces of salt, and two ounces of salaratus, in sufficient hot rain water to saturate the skin; when cool enough not to scald the hands, soak the skin in it for twelve hours; then wring out and hang up to dry. When dry repeat the soaking and drying two or three times, till the skin is sufficiently soft. Lastly, smooth the flesh side with sand-paper or pumice stone.

VARNISH FOR TOOLS.

Tallow, two ounces; rosin, one ounce, and melt together. Strain while hot to get rid of specks, which are found in rosin. Apply a slight coat to your tools with a brush, and it will keep off rust for any length of time.

TO DYE LEATHER BLUE, RED OR PURPLE.

For red, steep the skins in alum water; then pass them through a warm decoction of Brazil wood. Blue, steep them in an indigo vat. Purple, steep the skins in alum then put them into a warm decoction of logwood.

TO TAN A HIDE WITH THE HAIR ON.

When taken from the animal, soak in cold water to remove the blood and dirt; then spread it, flesh up, and put upon it two parts of salt, two parts of saltpetre and alum combined; make it fine and sprinkle it evenly over the surface: roll it up and let it remain in a cool place for a few days until the ingredients are dissolved. Then take off the flesh and nail the hide to the side of an out-

building in the sun; stretch it tight, to make it soft like harness leather; apply neats-foot oil and again fasten it up in the sun; then rub out all the oil you can with a wedge-shaped stick or moon knife, and you will have a fairly pliable piece of leather with the hair on.

OIL ADULTERATIONS.

Adulteration of animal oil, or mineral oil, may be detected by adding concentrated sulphuric acid, when the animal oil will be charred, forming black rings in the sample. Vegetable or animal oils can also be detected by adding an alkali to the sample, thus causing those to saponify, as mineral oils have not the property of saponification readily. Oils are frequently adulterated with cotton-seed oil, which is prone to ignite waste spontaneously.

TO GLUE LEATHER TO IRON.

There is a constant inquiry as to the best plan for fastening leather to iron, and there are many recipes for doing it. But probably the simplest mode, and one that will answer in a majority of cases, is the following: Paint the iron with some kind of lead color, say white lead and lamp-black. When dry, cover with a cement made as follows: Take the best glue, soak it in cold water till soft; then dissolve it in vinegar with a moderate heat; then add one-third of the bulk of white pine turpentine, thoroughly mix, and by means of the vinegar make it of the proper consistency to be spread with a brush, and apply it while hot; draw the leather on quickly and press it tightly in place. If a pulley, draw the leather around tightly, lap and clamp.

GLYCERINE LEATHER POLISH.

Mix most thoroughly together three or four pounds of lamp-black and one-half pound of burned bones, with five pounds of glycerine and five pounds of syrup. Then gently warm two and three-fourths ounces of gutta-percha in an iron or copper kettle until it flows easily; then add ten ounces of olive oil, and when completely dissolved, one ounce of stearine. This solution, while still warm, is poured into the former and well mixed. Then add five ounces of gum senegal, dissolved in one and one-half pounds of soft water, one-half ounce of lavender or other oil to flavor it. For use, it is diluted with three or four parts of water. It will give a fine polish, is free from acid, and the glycerine keeps the leather soft and pliable.

WATER-PROOF COMPOSITION FOR LEATHER.

Linseed oil, one pint; suet, one-half pound; beeswax, six ounces; resin, one ounce; turpentine, one-fourth pint. Melt the wax, suet and resin, and then add the oil and turpentine.

TO RENDER GLUE INSOLUBLE.

In order to render glue insoluble in water, even hot water, it is only necessary, when dissolving glue for use, to add a little potassium bichromate to the water, and expose the glued part to the light. The proportion of bichromate will vary with circumstances; but for most purposes, about one-fiftieth of the amount of glue will suffice.

BLACK LACQUER FOR SHOES AND LEATHER.

Mix four ounces of shellac and one-half ounce of the finest lamp-black in a strong bottle with one and one-fourth pints of strong alcohol. Close the mouth of the bottle with a damp bladder. Let it remain for twenty-four hours, shaking it occasionally during that time. Then pierce a hole in the bladder with a needle, place the bottle in hot water and let it stand for half an hour, taking it out often and shaking it. Unfasten the bladder, pour one ounce of Venetian turpentine into the bottle, close up the mouth again and place it once more in hot water. The bottle should be always corked, and it requires to be shaken before using the contents.

LEATHER BELTS.

All leather belts should be run with the grain side next to the pulley, which will transmit thirty per cent more power than will the same belt with the flesh side to the pulley. Care should also be taken that the belts are kept soft and pliable. When the belt is pliable and only dry and husky, blood-warm tallow should be applied. This applied and dried in by heat of the fire or sun will tend to keep the leather in good condition. The oil of the tallow passes into the pores and fibers of the leather, serving to soften it, while the stearine is left on the outside to close the pores and leave a smooth surface. The addition of resin to the tallow for belts used in wet, damp places will be of service and help to preserve their strength. Belts which have become hard and dry should have an application of neats-foot or cod liver oil mixed with a small quantity of resin. This prevents the oil from injuring the belt and helps to preserve it. There should not be so much resin as to leave the belt sticky.

WATER-PROOF OIL BLACKING.

Camphene, one pint. Add all the India rubber it will dissolve. Currier's oil, one pint; tallow, seven pounds; lamp-black, two ounces. Mix thoroughly by heat.

LEATHER CEMENTS.

The following recipes are given as the result of many years' experience: (1.) Common glue and isinglass, equal parts, soaked for ten hours in just water enough to cover them. Bring gradually to a boiling heat and add pure tannin until the whole becomes ropy or appears like the white of an egg. Buff off the surfaces to be joined, apply the cement warm and clamp firmly. (2.) Mix ten parts of bisulphide of carbon with one of oil and turpentine, and then add enough of gutta-percha to make a tough, thickly flowing fluid. One essential pre-requisite to it, through union of the parts, consists of freedom of the surfaces to be joined from grease. This may be attained by using bicarbonate of soda, ammonia or borax and by laying a cloth upon them and applying a hot iron for a time. The cement is then applied to both pieces, the surfaces brought into contact and pressure applied until the joint is dry. (3.) Another leather cement is made of gutta-percha dissolved in bisulphide of carbon, the mixture being about the thickness of syrup. The parts to be cemented must be well coated so as to fill the pores of the leather. Then heat the cement and join the ends, hammering the parts until the cement is cold. (4.) To cement leather to metal with hot gelatine, steep the leather in an infusion of nutgalls, hot, and bring the two together. (5.) One pound of gutta-percha, four ounces of India rubber, two ounces of pitch, one ounce of shellac, two ounces of linseed oil, melted together. It hardens by keeping and needs remelting for use. (6.) Leather to metal: Melt together equal parts of asphalt and gutta-percha and apply hot under a press. (7.) Digest one part of crushed nutgalls with distilled water for six hours, and strain. Macerate glue with its own weight of water for twenty-four hours and dissolve. Spread the warm infusion of the galls on the leather and the glue on the roughened metallic surface. Apply the prepared surfaces together and dry gently. The leather then adheres so firmly to the metal that it cannot be removed without tearing. (8.) Leather to pasteboard: Strong glue, fifty parts, is dissolved with a little turpentine in a sufficiency of water over a gentle fire. To

the mixture is added a thick paste made with 100 parts of starch. It is applied cold and rapidly.

BOOT AND SHOE SOLES FINISH.

The following finish has been patented in Germany: Paris yellow, 750 grammes; chrome yellow, 750 grammes; pipe clay, 1,250 grammes; quercitren, 1,000 grammes; alum, 1,000 grammes; sulphuric acid, 750 grammes. Mix and boil with sixteen litres distilled water, and one litre solution of gum tragacanth. For hemlock sole the following is to be used: Spirits of wine, saturated solution hypochloride of soda, hydrochloric acid, each in equal weights.

TANNING FURS.

In the fall of the year, when the skins from fur-bearing animals begin to appear in the market, the question of tanning with the hair on is an important one in many localities. When the skins are purchased, if not already tanned, the legs and all useless parts should be removed; soak the skins until soft, and then remove all superfluous adhering flesh, then soak in tepid soft water one hour. For each skin make a solution consisting of borax, one-half ounce; saltpetre, three-fourths ounce; globular salt, one-half ounce. Dissolve or moisten with soft water sufficient to spread on the flesh side of the skin. Put on with a brush, taking into consideration the different thickness and apply accordingly; keep in a moderately cool place for twenty-four hours, when the skin is to be washed thoroughly clean; and take, sal-soda, one ounce; borax, one-half ounce; hard soap, two ounces. Melt together slowly, taking care not to bring to a boil, and apply the heated mixture, while warm, to the flesh side. Heat up again, and keep in a warm place for twenty-four hours longer. Wash clean again as before, and apply salaratus, two ounces; hot soft water, three quarts; alum, four ounces; salt, eight ounces. Dissolve in the water the other ingredients; when sufficiently cool to allow the handling without scalding the bare hand, put in the skin and allow it to remain for twelve hours; afterwards wring out the moisture and allow twelve hours longer in which to dry. Finish up with pulling and working, and finally by rubbing with a piece of sand-paper or pumice stone. The above has been found the best of all formulas for tanning any furs, such as fox, wolf, bear, coon, and all skins where the fur was desired, and imparting also that fine gloss peculiar to fine furs.

FLOUR PASTE.

For wax upper, kip, calfskins and flesh splits: For every gallon of soft water used, take one quart of best flour—patent flour preferred—and one-fourth pound of common laundry soap, and one-half pound of best cake tallow. Patent flour sifters, holding just one quart, will be found convenient for this work, for, by dropping the sifter into the barrel and giving to it a rotary motion, the flour is readily sifted and measured. Put the quantity of flour required in a pail and mix with soft water, being careful not to get in too much water until after the flour has been well kneaded, by hand or by a stick. Then reduce the batter by uniting with it the required amount of water. Cut the soap and tallow into thin pieces and put them into the flour. For cooking it a small jacket steam kettle is preferred, but if not at hand blow direct steam into the pail or keg; but in the latter, allowance must be made during the cooking of twenty minutes time, as during that period there will be nearly one quart of condensed steam added. Cook slowly until the flour, soap and tallow are thoroughly united, and the paste assumes the consistency of a thick jelly.

GUM TRAGACANTH.

This is the last ingredient used in the final finish for wax upper, kips, calfskins and splits. It is used as follows: For a ten gallon crock take one pound of the gum, and fill the crock with soft water and stir it occasionally, because when it commences to dissolve it will pack in solid lumps. The older it is the better. It will ferment in the early stages, then commence to ripen up and be in condition for use. Several crocks should be kept in constant use for soaking the gum, and where large quantities are used, half-barrels may be substituted. When gumming the leather, it is prepared as follows: Take about seventy per cent of the dissolved gum tragacanth, and thirty per cent of flour paste, as used in pasting. Mix and strain through coarse toweling, then reduce to the consistency of cream, and apply with a soft lambs-wool sponge.

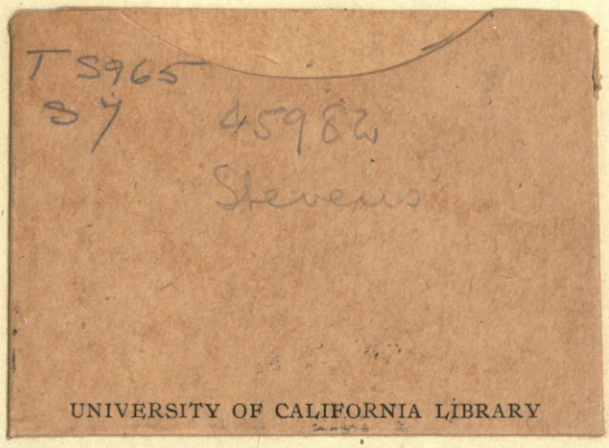
THIS BOOK IS DUE ON THE LAST DATE STAMPED BELOW

AN INITIAL FINE OF 25 CENTS WILL BE ASSESSED FOR FAILURE TO RETURN THIS BOOK ON THE DATE DUE. THE PENALTY WILL INCREASE TO 50 CENTS ON THE FOURTH DAY AND TO $1.00 ON THE SEVENTH DAY OVERDUE.

MAR 5 1934
MAR 8 1934
3-7-34 S
26Nov'49CS
21Oct'52KF
OCT 22 1952 LU
DEAD
MAR 21 1934
APR 4 1934
APR 18 1934
5-2-35
MAY 15 1934
MAY 29 1934
DEC 26 1941
MAY 22 1948

LD 21-100m-7,'33

YD 03866


TS965
S7 45982
Stevens
UNIVERSITY OF CALIFORNIA LIBRARY